A
COLLECTION
OF
PAPERS
ON
NAVAL ARCHITECTURE,

ORIGINALLY COMMUNICATED THROUGH THE CHANNEL
OF THE

EUROPEAN MAGAZINE,

IN WHICH PUBLICATION THE FURTHER COMMUNICATIONS ON THIS
SUBJECT WILL BE CONTINUED.

TO WHICH ARE ADDED,

I. An APPENDIX of ORIGINAL LETTERS, &c.; containing various COMMUNICATIONS and OBSERVATIONS on SUBJECTS connected with NAVAL ARCHITECTURE.

II. An ESSAY towards a GENERAL VIEW of the LITERATURE of the ART of SHIP-BUILDING. By Capt. MULLER.

III. BOOKS relating to the EXPLICATION of the TECHNICAL TERMS of the ART of SHIP-BUILDING.—WRITINGS relating to the THEORY of the ART of SHIP-BUILDING.—WRITINGS relating to the PRACTICE of the ART of SHIP-BUILDING. By the SAME.

IV. APPENDIX to the CATALOGUE of BOOKS on NAVAL ARCHITECTURE; containing ſuch as are omitted by the AUTHOR of the ESSAY on the LITERATURE of SHIP-BUILDING.

PART II.

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ADVERTISEMENT.

"WHILE the PROPRIETORS of the EUROPEAN MAGAZINE congratulate themſelves on having firſt ſuggeſted, and fortunately proved the humble Inſtruments of ESTABLISHING A SOCIETY FOR THE IMPROVEMENT AND STUDY OF NAVAL ARCHITECTURE, they deem it neceſſary to declare, That though ſome of the Individuals intereſted in the former are alſo connected with the latter, yet they are not ſo COLLECTIVELY; and as many Papers on the Subject of Ship-building were received previous to the SOCIETY being formed, which they have not yet had an Opportunity of inſerting, they conſider themſelves in Duty bound to introduce them to the Public through the *Wrapper* of their Magazine; not as the Act of the SOCIETY, but as that of the PROPRIETORS; a Vehicle which they flatter themſelves may prove the means of preſerving many fugitive valuable Hints, that might be deemed unworthy of a Place in an intended Publication of the TRANSACTIONS of the SOCIETY."

The above Apology, which has been repeated in the uſual place before ſuch Pieces as came to hand prior to the INSTITUTION of the SOCIETY alluded to, we apprehend will render any further obſervations unneceſſary. We are inclined to believe that much information on the ſubject of NAVAL ARCHITECTURE ſtill remains in the Cabinets of the Curious; with which if we are favoured by the poſſeſſors, it ſhall find a ready and ſpeedy inſertion, if not on the *blue Wrapper* of the EUROPEAN MAGAZINE (which has been found too limited to contain the whole of the Communications with which we have been honoured), at leaſt in the future PARTS of this COLLECTION.

By thus collecting various opinions into one view, the SOCIETY as well as the PUBLIC may be enabled, *perhaps*, to form a judgment of what ſhould claim their future attention and purſuit.

The more we become acquainted with the ſubject, and with profeſſional men of great experience, the more we have to lament that

THERE ARE NO CERTAIN DATA TO PROCEED UPON.

This difficulty, however, does not, as it ought not to, deter us from the proſecution of our enquiries; on the contrary, it ſtimulates us to purſue our plan with alacrity and perſeverance; fully convinced that the liberality of the age will furniſh ample means to try experiments on a larger ſcale than has hitherto been done in any other country towards eſtabliſhing ſo deſirable an object.

12th *November*, 1791.

MARINE INTELLIGENCE.

AN ECCLESIASTIC, whoſe life has been chiefly employed in the ſtudy of Naval Architecture theoretical and experimental, having been on board D'Orville's and other fleets in their different cruizes and actions, has compiled a very large work, beginning with the minutiæ, and proceeding regularly to the moſt important combinations of a fleet and actions; if our information is right, ſomewhat ſimilar to Pierre La Hoſte, but much more enlarged, and improved to the preſent time. Whenever this elaborate work is publiſhed, we ſhall take care to be in poſſeſſion of a copy.

The NATIONAL ASSEMBLY of FRANCE have received and adopted a new Treatiſe of Naval Architecture, ſaid to be more complete than any hitherto publiſhed. It is now in the preſs, and expected to appear in a few months, when we ſhall take care to be poſſeſſed of a copy for inſpection of the curious; alſo ſome for ſale, if they can be procured.

The ſame ASSEMBLY have alſo come to a reſolution not to permit any ſhip, mercantile or others, to be employed, except ſuch as are French-built.

A Correſpondent has tranſlated the Abridgement of that elaborate and ſcientific work from the Spaniſh of D. George Juan, which is now completed, and we hope will ſoon be put to preſs.

TO THE RIGHT HONOURABLE

JOHN EARL OF EGMONT,

VISCOUNT PERCEVAL OF KANTURK, BARON LOVELL AND HOLLAND OF ENMORE, BARON PERCEVAL OF BURTON, &C. &C. &C. FIRST LORD COMMISSIONER OF THE ADMIRALTY, AND ONE OF HIS MAJESTY'S MOST HONOURABLE PRIVY COUNCIL.

MY LORD,

THE much-wiſhed-for prudent and humane arrangements that have been made in the Dock-Yards and elſewhere in the Royal Navy; the great ſatisfaction which on this occaſion hath diffuſed itſelf throughout theſe kingdoms, ſince your LORDSHIP hath been ſeated at the head of the maritime affairs of this nation, is ſo well known, as to ſtand in need of no further comment.

"Zeal for the public good," ſays a late eminent and ſpirited writer, "is the characteriſtic of a man of honour and a gentleman, and muſt take place of pleaſure, profit, and all other private gratifications."—Your LORDSHIP therefore, animated with theſe noble views, by an unwearied application into the arcana of the Navy, by a ſteady attendance on the duties of your important office, hath let the world know, that the diſtinction of birth, wealth, and high ſtation, is as it were a tax upon a good mind to endeavour, as far as the occurrences of life will give him leave, to temper public ſpirit with humanity. That your LORDSHIP may have an opportunity for the farther exertion of the amiable qualities with which nature hath enriched your LORDSHIP, is the purport of this Dedication.

I ſhall beg leave to add a word or two more:—That in recommendation of the following ſketch to your LORDSHIP's patronage, I have this at leaſt to plead, the honeſty of its intention; and have this at leaſt to hope, that an attempt of this tendency cannot but obtain a favourable reception from your LORDSHIP: for as the principal end and deſign of this tract means to convey to the *ſubject* ſatisfaction and relief,—to the *Crown* laſting and ſolid advantages; as it looks toward the farther ſecurity and preſervation of the Royal Navy; it does therefore, by a natural kind of Right, come to your LORDSHIP for protection: and ſhould your LORDSHIP condeſcend to think I may not be altogether unſucceſsful in the attempt, I ſhall have the honour of being indebted to your LORDSHIP for a pleaſure, that will ever gratefully remain on the mind of,

MY LORD,

With the profoundeſt Reſpect,

Your LORDSHIP's

Moſt Obedient and

Moſt Humble Servant,

THE AUTHOR.

Hackney,
April 1766.

AN EARNEST

ADDRESS

TO THE

PEOPLE OF ENGLAND.

A COMPLAINT as well of the ſcarcity as the dearneſs of timber, throughout the Britiſh Dominions, having been for ſome time looked upon as a very ſerious affair; it cannot therefore but be deemed a laudable enquiry, as it certainly is an intereſting one, to endeavour to aſſign the cauſe, and to offer ſome hints that may tend to leſſen the conſumption of it.

As to the propagating and raiſing of timber, &c. the writer of this Eſſay has not the vanity to think he can have any thing to offer, but what muſt fall infinitely ſhort of the elaborate treatiſes that have been publiſhed on that head, by men of great probity, learning, and ingenuity; yet, notwithſtanding, if there be any degree of merit in the bare attempt, only to *ſecure* and *preſerve it*; he is not without hopes, that he hath thereby endeavoured to deſerve the approbation of thoſe to whom this is addreſſed. For, will any one ſay, there is any force ſo *conſtitutional*, or any ſecurity ſo *great*, *powerful*, and *laſting* to theſe kingdoms, as the *Navy?* Certainly no. Then ought we not in particular to guard againſt whatever has the leaſt tendency to cramp and leſſen the growth of the invaluable tree out of which our floating caſtles are formed? But of this, at preſent, enough.

In the firſt place, then, as to an enquiry into the cauſe of the great ſcarcity of timber throughout theſe realms, we need only *conſider* a little, and the reaſon will come home to us very clear.

Let us then turn our eyes to the ſeveral counties where there ſtood, in the memory of people who are now living, ſome thouſands of timber-trees, and we have the melancholy proſpect to behold, in many places, not ſo much as an oak plant left ſtanding: ſeveral thouſand acres of woodland having been grubbed up, that are now turned into arable and paſture, though contrary to ſeveral ſolemn Acts of Parliament therein made and provided. Even in the Royal Foreſts, we diſcern in many places a ſenſible diminution of timber; but whether this proceeds entirely, though it muſt in great part, from that quantity which has been cut down for the purpoſe of the Navy, ſeems to be a matter of great doubt.

The many printed warnings, and ſpirited remonſtrances, that have been made by men under a concern for their country, have at laſt had a very powerful effect on many of the noblemen and gentlemen, that hath induced them, out of the regard they owed to poſterity, either to make plantations of timber on their own lands, or (uniting themſelves into a patriotic Society) to incite by public reward a general attention to ſo good a work; gentlemen, who (in the words of a late Author on Planting) "encourage every thing which has the " leaſt tendency or appearance of promoting the good of the public; " and who, laying aſide their grandeur, and ſumptuous and coſtly " equipages, at all leiſure times apply themſelves to planting, as if " they had really no other way of life but that, and who, encouraging " all endeavours of this kind, both by precept and example, may one " day ſhine out as bright in the annals of Britain, for their real ſkill " and practice in huſbandry and planting, as the Cincinnatus's, Hortenſius's, Agricola's, &c. did in that of Rome."

We read in an ancient author, who, as an encouragement to planting of timber, &c. hath handed the remark down to us, that "a " certain frugal and moſt induſtrious Italian Nobleman, after " his lady was brought-to-bed of a daughter (conſidering that wood " and timber was a revenue coming on whilſt the owners were aſleep), " commanded his ſervants immediately to plant in his lands, which " were ample, oaks, aſhes, and other profitable and marketable trees, " to the number of one hundred thouſand; as undoubtedly calculating, that each of thoſe trees might be worth twenty pence before " his daughter became marriageable, which would amount to 100,000 " *francs* (which is near ten thouſand pounds *ſterling*), intended to " be given with his daughter for a portion." This, ſays the hiſtorian, was good philoſophy, and ſuch as we are aſſured was frequently practiſed in Flanders upon the very ſame account.

However aſtoniſhing the foregoing may appear at firſt ſight, Captain Smith, the ingenious author on Foreſt-trees, in his very accurate and no leſs laborious calculation, hath convinced us of ſomething more extraordinary, which, for the benefit and entertainment of thoſe who may not have ſeen the book, is here inſerted in the Captain's own words. "That a thouſand acres of land, planted at one foot diſtance, in 7,201 rows, taking up 51,854,401 ſets of oak, aſh, and " cheſnut, (or to be ſown) taking up 17,284,800 of each ſort, and " fit to be tranſplanted at three years end (if ſet in good ground), are " worth eighteen pence the hundred; and there being 345,696 hundred, it amounts to no leſs than 25,927*l.* 4*s.* beſides the cheſnuts, of " which there being 17,284,800, (valued at half a crown a hundred) " they come to 21,606*l.* and the total of both, to 47,333*l.* 4*s.*"

This being made out, conſider what an immenſe ſum *great tre* would amount to, and in a large quantity of land; ſuch as were worthy a *royal* undertaking: It is computed, “ that at three foot diſtance the firſt felling (that is, eight or nine years after their planting), ſuch woods would be worth in hoops, poles, firing, &c. 55,015*l.* and the ſecond felling 28,657*l.* 19*s.* 5*d.* and the fourth (which may be about thirty-two years after ſowing) 90,104*l.* 17*s.* and ſo forwards.

“ At four foot diſtance alſo, allowing the ſame time for felling, it will amount to 34,001*l.* 9*s.* 4*d.* and the next to much more, in regard the wood will ſpring up much thicker, ſo that at the fifth felling, the account comes to 126,992*l.* 10*s.* 2*d.* &c. and at the ſeventh (whoever lives to ſee it) it will amount to 200,000*l.* And if planted at a wider diſtance, viz. eighteen foot (according to the Captain's method) at thirty or forty years growth, you may compute them worth 192,961*l.* 6*s.* and in ſeventy years, 201,001*l.* beſides three years crop of wheat, or other grain, in all 410,312*l.* 16*s.* which, at thirty-ſix foot aſunder (the utmoſt diſtance that needs to be allowed to timber-trees), it takes up (for the thouſand acres) 40,401 trees for the firſt 100 years. Then,

“ To make room as they grow larger, grubbing up every middle tree, at 9*l.* a piece, 19,800 trees amount to 99,000*l.* and the reremaining 20,601 at 200, or 220 years growth, at but 8*l.* per tree, comes to 164,808*l.* beſides the inferior crops of graſs, corn, &c. in caſe there is no underwood ſown in the intervals, reckoning 80,000 buſhels for three years produce, at 5*s.* per buſhel, which will amount to 22,500*l.* beſides the ſtraw, chaff, &c. which is at 5*s.* a load, and at 3*d.* a buſhel chaff, comes to 2,025*l.* So that the total improvement (beſides the 217 years emolument ariſing from the corn, cattle, &c.) amounts to 288,333*l.*”

And theſe trees (as well they may) coming to be worth for timber 20*l.* an oak; the 20,601 trees amount to 412,020*l.* the total improvement, therefore, of the thouſand acres (the corn profits not computed) aſcends to 675,833*l.* So that admit there were in all England 20,000 acres thus planted, at two foot diameter (and, as may be preſumed, thirty foot high, which in 150 years they might well arrive to), they would be worth 13,516,660*l.* an immenſe and ſtupendous ſum, and an everlaſting ſupply for all the uſes both of ſea and land. But it is to Captain Smith's laborious works that we have the total charge of this noble undertaking, from the firſt ſemination of them to their maturity; by which it will be eaſy to compute what the gains will be for any greater or leſſer quantity.

The reader will eaſily pardon the digreſſion, when he is informed, that the foregoing and ſubſequent paragraphs were inſerted, not only as ſo many prevailing arguments in favour of planting, but from a deſire alſo of doing juſtice to the labours of the ingenious.

“ * When we conſider that trade, riches, and ſtrength, are inſeparable, and that their great dependence is upon our navy, we might have hoped ſo great a concern to the nation ſhould have occaſioned

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* The Whole Art of Huſbandry, Vol. II. by J. Mortimer, Eſq. F. R. S.

“a greater care in propagating and preſerving of timber that is of principal uſe to ſupport it. And though we cannot expect to find many in this age public-ſpirited enough to have ſuch a regard to the general good, as to prefer it before their private intereſt; yet, the particular profit that timber brings to the owners of it, as well as its advantage to the public, might, if it had not cauſed more care in the propagating of it, have at leaſt prevented thoſe that have had opportunities of experiencing its advantage, from making that deſtruction and general ſpoil that has every where of late been made of woods, had they kept particular accounts of the profit, or been able to make a true judgment of their own advantage, which, I think, in moſt places, to exceed that of the plough, or moſt other ſorts of huſbandry.”

* “The neceſſity of reſtoring a ſupply of wood and timber, is but too evident from the late deſtruction and decay, and from the want and ſcarcity now felt by the inhabitants of moſt counties. And we have a freſh example of a neighbouring Prince taking that matter particularly into conſideration. The King of France being informed of the neceſſity there is of recruiting that kingdom with timber and other trees, which have been conſiderably diminiſhed in their ſpecies; by an arrêt of his Council of State, dated May 3, 1720, ordains the enlarging of the highways, and the planting of them and the bye-roads all over the kingdom with elms, beeches, cheſnut and other fruit-trees, &c. according to the nature of the ſoil, at thirty foot diſtance from each other. This arrêt may be ſeen at large in the Daily Courant of May 10, 1720.” Again from the ſame author:

“Our wood and timber have of late been ſo much deſtroyed, the growth ſo far neglected, and ſo little care taken to plant a ſupply, that there is ſcarce now ſufficient left to ſatisfy our preſent occaſions; and, what is moſt to be lamented, in time there will not be enough found to build a fleet to guard our coaſts, or merchant ſhips to carry on our trade.” Again:

† “Huſbandry and gardening are ſciences well becoming the greateſt philoſophers; they have the pleaſure of taming and civiliſing the little wildneſſes of Nature, and by that means of ordering her works in ſuch a manner, as to make them become profitable and uſeful to our intereſts. We are charmed with her numberleſs beauties; we recreate our ſenſes in the moſt innocent manner. We preſerve health of body; and I may add, we are free from noiſy and impertinent clamours, which daily preſent themſelves in the hurried part of the world; and if theſe ſtudies have the ſame effect upon the minds of others that they have upon me, they do not a little contribute to ſet forth the wiſdom and power of the great Creator.” The ſame author obſerves, that,

“We cannot be too induſtrious in providing our country with ſuch things (more eſpecially while we are at peace with other nations)

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* Propoſals for the Improvement of Common and Waſte Lands.

† Treatiſe of Huſbandry and Gardening, by Richard Bradley, Eſq. F. R. S.

“ that we might not be able to compaſs in time of war; and above all
“ ſuch as are uſeful to our Navy, the invincible walls of Britain. Let
“ us then no longer delay to make proviſion for oaks; for though
“ they are a little tedious in their growth, we ought to have ſo much
“ regard for our ſucceſſors, that they may not want, or be provoked
“ to curſe their anceſtors for neglect. The plantation and care of
“ timber, &c. is like the buying of the reverſion of an eſtate; for lit-
“ tle money expended, we become heirs to great ſums; and is ſome-
“ thing ſimilar to what I have heard, viz. that herbs grow in pence,
“ ſhrubs in ſhillings, while timber grows in pounds.”

Mr. Bradley then proceeds to give us his thoughts concerning the preſervation and improvement of timber, where his reaſons appear very lively and ſtrong: and, indeed, we find that moſt of our modern authors in their obſervations have borrowed ſomething from him, although they do not every where acknowledge it.

His vegetative progreſſion, explained by a caſe parallel to the increaſe ariſing from the putting of money out at intereſt, which improves by gentle degrees in length of time from a mere trifle to a large ſum, is very curious, and if the reader is induced to become a planter, he is therefore referred to the book itſelf.

After what has been ſaid, reſpecting as well the private as public advantages that ariſe from the propagation of wood and timber; whether we conſider it either for the purpoſes of ſhip or houſe building, for utenſils, fuel, or otherwiſe; it ſhould ſeem then a matter of the greateſt ſurprize imaginable, why the planting of timber, &c. or the keeping up a ſtock equal to what has been hitherto planted, ſhould have been ſo far neglected as it has in general been.

Among the many reaſons that have been aſſigned, one, indeed, has been hinted by almoſt every author that has wrote on this ſubject, and which ſeems to be univerſally agreed to, which is this: That either the Acts of Parliament now in being for the further encouragement of planting of trees, &c. and for the better preſervation of the ſame, are not enforced with that reaſonable warmth and vigour they ought to be; or, that the penalties therein inflicted are not by any means *heavy* enough; they being in no degree adequate to the offence: That, it being as it were everybody's and nobody's buſineſs, is one very great reaſon why ſuch waſtes and depredations have been made in woods and plantations, and why the laws reſpecting the planting again, &c. after the timber-trees are cut down, have been ſo ſhamefully eluded. “ The poor (ſays Mr. Bradley, in his Thoughts concerning the Preſervation of Timber, which has been recommended to the peruſal of the reader), “ who make the greateſt body of the na-
“ tion, are, through their neceſſities, driven ſometimes to make free
“ with their landlord's woods and coppices for fire-wood, without
“ being ſenſible of the damage they do in cutting down the young
“ thriving plants or ſprouting trees in the vigour of their growth, to
“ make them become pollards. Theſe people as they have no trees of
“ their own, cannot be ſuppoſed to be capable of judging any farther
“ of the deſtruction they make, than barely that what they take is of

" no more value than the price of a common faggot, or the ſame
" quantity of wood ſold in the market, tho' perhaps the damage done
" to the owner of the wood may be five hundred times as much: for,
" one may ſpoil twenty young thriving trees to make up a faggot of
" twopence value."

Mr. Bradley then very judiciouſly obſerves, there can be no other way propoſed for the improvement and preſervation of timber, than to make it the intereſt of every one to plant and preſerve it; recommending that, in all future grants for that purpoſe (either of waſte or common lands), there be one part appropriated for wood for Firing, for the uſe of the commoners or poor; another for timber; and the other part for the ſole uſe of the Lord of the Manor, unleſs where it is foreſt land, and ſuch places where the King has a right of timber; and in ſuch caſe the King's part ſhould be planted without any expence to his Majeſty. When this is done (he ſuppoſes) it will be as well the intereſt of one as the other of the commoners in the pariſh, as well as the Lord of the Manor, to preſerve the plantations from any danger or inſult; and all together will take care of the King's part, which might be ſo ſettled, that in caſe there could not be found a certain number of trees in proſperity for the King's uſe, the pariſh ſhould be obliged to make them good in money; and ſo the ſame to the Lord of the Manor, in caſe their number, &c. of trees were deficient.——By theſe means he concludes, that the country may be ſtored with timber and fire-wood, the poor benefited, the eſtates of the gentry improved, and the Crown enriched, without expence or trouble to the public.

As to the improvement of private eſtates, one anecdote I cannot here omit, wherein Mr. Bradley informs us, that an eminent merchant, a particular friend of his (in whatever leaſes he granted his tenants), always took care to have a clauſe inſerted, to oblige his tenant to plant a certain number of trees yearly, or at the expiration of a term of years to pay him ſo much money for every one that was wanting: by which means the tenant became, as it were, the guardian of his landlord's plantation, and would plant and preſerve his trees more effectually than any ſervant upon hire would do.

Having endeavoured to ſhew (by a general account of theſe matters), from whence has proceeded the ſcarcity of timber, and conſequential thereto, to ſelect ſuch paſſages as we thought convenient; I ſhall now beg leave to offer my thoughts as to another material cauſe of this ſcarcity, more particularly in regard to that ſpecies of timber that has been made uſe of in building and re-building of ſhips. What is here hinted at, relates to the want of having made to the artificers of his Majeſty's Dock-Yards a gratuity equivalent to the value of the waſte which comes off from the timber, &c. in the courſe of their work. To this they lay a claim, as their lawful perquiſite; and it appears that cuſtom, ſince time immemorial, hath confirmed it.

To be ſure it is very natural to infer, in the application of ſuch a vaſt quantity of timber, &c. for the purpoſes of the Navy (formidable as it now is), that the waſte muſt of neceſſity be very great; but, ſay thoſe not altogether acquainted with the manœuvres of the Dock-yards, How can it be made appear, that by prohibiting the workmen's carrying away the waſte wood, there would have been any more trees ſtanding in Great Britain, than what there is? or if there had, the number might perhaps have been ſo inconſiderable, as not in any degree to have counter-balanced the money given in lieu of the workmen's privilege? To all which a general reply, only, will at preſent be given, which is this: That had ſuch a regulation been made about the time of the Revolution, ſuppoſing the Government had not ſaved ſo much as a ſingle ſhilling; yet it ſhould ſeem highly probable, there would have been many thouſand more timber-trees ſtanding for the uſe of ſhip-building, than what there now is. Yet ſo far I muſt own, that had any man preſumed to have aſſerted this to me, before I had gained ſome knowledge in theſe things, and had maturely conſidered of them, I ſhould have began to ſuſpect, that either he meant to impoſe on my underſtanding, or, that the arguments he could produce in ſupport of ſuch an aſſertion, muſt have been either *trifling* or *inſufficient*. Suffice it then to ſay, that from a caſual intercourſe with a gentleman on the Weſtern road, in my way to *P——h*, the firſt hints were given which gave riſe to this publication, and I doubt not, but to the more *intelligent* and *unprejudiced* part of my readers it will prove acceptable; eſpecially to *them* in particular, who are attentive not only to the welfare of the preſent generation, but to their *deſcendants*---the race of *Britons* who are to make their appearance after them.

The ſcarcity of wood and timber becoming the topic of our converſation, my friend as above took occaſion to remark in a very ſerious manner, that " could the workmen of his Majeſty's Dock-Yards but
" once be brought to a reaſonable compenſation for the waſte of timber
" (or chips as they are called), that is now allowed them, or
" that they find means, through opportunity and the force of cuſtom,
" to get at, it would be the ſaving of a prodigious quantity of offal-
" wood, that, if not ſerviceable in the King's-yard, might (he apprehended)
" be applied to various uſes out of it, and thereby ſave a
" great deal of young timber; but that he believed the Government
" would never conſent to give them half-a-crown, which would be
" five-pence a day, more than their day-pay, on conſideration of giving
" up the ſaid privilege: becauſe, added he, thoſe that guide the
" helm, muſt firſt of all be convinced, and 'tis but requiſite they ſhould,
" that the Crown would be no loſer by ſuch a regulation. As to my
" own part, continued my unknown friend, I am firmly of opinion
" that they would be great gainers by it. But then, how is this to be
" proved?---There lies the great difficulty. However, from what I
" have ſeen and heard of theſe matters, was I better acquainted with
" the names of ſome of their terms of Art, and of the materials, &c. ſo
" that I might be able to make myſelf underſtood, and knew at the ſame
" time how to caſt my thoughts into ſome form and order; I flatter
" myſelf that, if circumſtances were to be admitted, and believed, I
" could produce ſuch evidence therein, as might to every reaſonable
" mind prove ſatisfactory. But, even then, when I had known

" all theſe things, judging it rather imprudent from one in my ſituation, who is dependant on the Navy, I cannot tell but I might " have concealed my thoughts from the notice of the public."

The frankneſs of my fellow-traveller's behaviour (altho' our ſentiments were not perfectly in uniſon at the cloſing of the laſt ſentence) prepoſſeſſed me ſo much in his favour, that I concealed my opinion at that time, from the fear indeed of giving it at the expence of his good company. Finding him therefore of a communicative turn, I indulged the thought of profiting ſome time or other by his remarks.

" You ſee then, Sir, rejoined the ſtranger, I tell you my mind very " freely; and when you come to be acquainted, that in the late war " I fitted out at three different Dock-yards, you will allow me to form " ſome tolerable notion of what we have been diſcourſing of.—I com" manded the ****** in the Mediterranean, and the ***** at " the taking of Quebec, under the brave Admiral Saunders; and " have heard my Carpenter ſay, that a perſon who was occaſionally " employed on taking ſurveys aſſured him, that when he belonged " to one of his Majeſty's Yards, the accounts of timber, &c. in " three years time were ſo defective, as to amount to above ſixteen " hundred loads, which, as my Carpenter told me, coſting one with " the other pretty near 4l. a load, muſt come to above 6000l. in that " Yard alone: ſo that for *one year*, *in one Yard* only, here is a loſs, you " ſee, of above 2000l. Now, Sir, you are to underſtand, that the " working people, excluſive of their right and property in the waſte of " timber, have hitherto been ſaddled with miſapplication of *all the* " *timber* which has appeared to have been miſſing at the time of taking " theſe ſurveys: but, ought we to ſuppoſe this to have been *always* the " caſe? You will perhaps be of another opinion, when a circumſtance " is related, which happened even in my memory while a Midſhip" man, when we fitted out at ******* ; it was this: That a man " concerned in the receiving of timber at *******-Yard, did *then* " *die*, leaving to his Widow &c. a fortune of above *ten thouſand* " *pounds*, which he had acquired in the ſpace of about ten or twelve " years. A very induſtrious man this, at the ſalary of no more than " forty-five pounds *per annum!*—This ſame perſon, I was informed " at Woolwich, had been a working-hand in that Yard. Now, Sir, " what do you think of it?" I replied, I cannot but look on it as a very alarming circumſtance, if it be true. " True! returned the Captain; " why, there is no one perſon whatever who lives on the " ſpot but knows it to be ſo. Therefore you ſee, my worthy friend, " I have endeavoured to give you *ſome reaſon*, why the deficiencies of " timber and other of the wooden materials, which have been diſ" covered at different periods of time, ought *not always* to have been " placed at the door of the artificer." My Fellow-traveller then perceiving me to give a nod of aſſent to the obſervations he had been kind enough to entertain me with, we therefore continued talking on various ſubjects, 'till the Captain, taking notice that, as his port lay further to the North, he muſt now ſteer a different courſe,—we accordingly took our leave of each other.

When I came to reflect on the converſation that paſſed between us, it recurred to me, that my Fellow-Traveller's differing from me in ſentiment might proceed from ſome particular reaſon, which, on ſo ſlight an acquaintance, he did not chooſe to mention: otherwiſe, I could never ſubſcribe to his opinion as to the impropriety, from his being an Officer in the Navy, of making any thing public, that he ſeemed firmly to believe had a direct tendency to do good in it; for, ſaid the Captain, as before cited, "Had I even *been* acquainted with "ſuch and ſuch things, I cannot tell but I might have concealed my "thoughts from the notice of the public." This is very ſtrange indeed! But with ſubmiſſion to my Fellow-Traveller (who may otherwiſe be of true courage, and a very honeſt well-meaning man), I muſt beg leave to diſſent from him in this particular, it being my humble but ſteady opinion, that it is the indiſpenſable duty of every Officer in the Navy, to promote as far as in his power lies, whatever tends to its intereſt and reputation, not only in that particular department he is commiſſioned to act in, but likewiſe in every other, when he can do it with propriety---as well by land as by ſea. Had this not have been my ſettled opinion, was *I* to be in a *public* capacity, it could never have been expected to have had any ſort of influence on the conduct of a man in a *private* one.

An invitation to ſpend two or three months of the laſt ſummer, with a near relation who lives not many miles diſtant from P—h, furniſhed me with both leiſure and opportunity to profit from the remarks I met with on the road thither. So that it remains no longer a ſecret what the hints were, which gave riſe to this publication. How far indeed my time was improved, while there, will beſt appear in the ſucceeding paragraphs. For if there is no merit, abſtractedly conſidered, in the performance itſelf, I am ſure all that is in the power of words to do, will not be able to recommend it. For, in theſe caſes, the public, who have an undoubted right to judge, *will not*, nor *cannot be deceived*.—Therefore leaving the work to ſpeak for itſelf, I ſhall proceed on in the ſame method the Captain would have purſued, had he prevailed on himſelf to have made the attempt.

Now having conſidered how I might be enabled in the beſt manner to obtain a free admiſſion into the King's Dock, as often as I thought fit, and likewiſe of the perſon or perſons the moſt convenient and proper to anſwer ſuch queſtions as I might have occaſion to aſk; it then occurred to me, that from the intimacy my relation had with one of the Head-Officers of the Yard, they would make no ſcruple at the Dock-gate to let me in, after we had once been ſeen together: and, in regard to the fixing on a perſon the moſt likely to oblige me with the intelligence and inſtruction I ſtood in need of, it ſuggeſted to me, that a ſuperannuated Officer belonging to the Dock, who the Captain, on parting, deſired to be remembered to, might of all men be the moſt proper.

Theſe points being at length ſettled to my entire ſatisfaction, it will be neceſſary to obſerve, that what converſation paſſed between the forementioned Officer and myſelf, will be related under the names of *Servus Publicus* and *Quæſtiarius Candidus*.

Candidus.

SCENE,—THE DOCK-YARD.

Candidus. A CAPACIOUS YARD this! and a very pleaſant day, *Publicus.* Pray, are any of your Men of War pretty far advanced in Building? If they are---if you pleaſe to accompany me we will go on board.

Publicus. With all my heart. That ſhip then a-head of us, you ſee, is the forwardeſt; we ſhall be preſently there.---Is ſhe not a fine ſhip?

Candidus. I think ſo, *Publicus*; but now we are on board, I ſhall be very plain to tell you---you muſt have a great deal of patience with me, for I ſhall be very inquiſitive. Theſe great pieces then over our heads, that lie acroſs the ſhip;---they are beams, I ſuppoſe?

Publicus. They are ſo, we call them by that name. It is theſe beams, you ſee, which keep the ſhip to her breadth, by holding her ſides together. They ſupport the deck over our heads in the ſame manner *that* is ſupported on which we ſtand. The decks are the ſame in a ſhip, you obſerve, as floors in a houſe.

Candidus. I comprehend you---your beams are moſtly made of oak, I imagine: Pray, how many in number is there which bear up the deck above us?

Publicus. Of the oak, there are twenty-ſix, only.

Candidus. How long may an oak-tree be growing to the length of this beam here, in the broadeſt part of the ſhip?

Publicus. Not leſs than one hundred years, I dare believe: but theſe beams are not made out of one tree, as you very likely may think; ---there being two to every beam, which, including the eight prongs, make together ſixty trees.

Candidus. What! Three-ſcore oak-trees to bear that deck up! Sure it cannot be.

Publicus. It is very true; and four-ſcore to ſupport the deck under us, for excepting two or three of them, each beam takes up three trees: and ſo again of the deck under this we walk on, called the Orlop, if you put aſide one or two of *them*, you will find each beam likewiſe to conſiſt of three trees.

Candidus. I ſhould be glad, then, you would let me know the names of the ſeveral *decks*; and after that, if you pleaſe---the whole number of trees of which the beams and prongs are made to ſupport *them*.

Publicus. I will ſo. The deck we now ſtand on, is termed the Gun-deck; that which is beneath us, the Orlop;---the deck that lies over our heads we call the Upper-deck; over which in the fore-part (towards the head) of the ſhip is another deck, though a very ſhort one, called the Fore-caſtle; and towards the ſtern (the aft-part of the ſhip) is another which is ſtyled the Quarter-deck; there is likewiſe another farther ſtill towards the ſtern that covers part of this (the Quarter-deck) named the Round-houſe. Theſe beams, indeed, being much ſhorter, and of a ſmaller ſcantling than thoſe I was ſpeaking of, together with many of the Quarter-Deck and Fore-caſtle, are made entirely out of one tree,---the reſt of them being compoſed of two.---The number of trees neceſſary to form the beams, as well of the *larger* as the *ſmaller* decks, I take to be, about two hundred and forty, or fifty.

Candidus. A great many, indeed! But pray now, can you inform me pretty near the matter, one with the other, what the ſolidity of each tree was before it was wrought?

Publicus. Why, that is a queſtion which cannot be reſolved with a degree of exactneſs, as to a foot or ſo; yet, if we attend to it from general obſervation, taking in the whole number of trees, *great* and *ſmall*, either *ſtraight* or *compaſs*, that are uſed in building a ſhip of this force and magnitude, I imagine that, one tree with another, its contents will meet ſomewhere betwixt eighty and ninety cubical feet.

Candidus. If I underſtand you right, you mean, there is as many above, as *under* eighty-five, or thereabout.

Publicus. I do ſo. And yet it is not unlikely, if the neat meaſure (or, as we term it, *neat contents*) of all the beams were to be divided by the number of timber-trees, as above, that, one with the other, they would not exceed twenty-ſix feet.

Candidus. But, have you been ever curious enough to aſcertain for each *reſpective deck*, the neat content, as you term it, of a tree, one with the other? whether the beams conſiſt of one two or three pieces; for *each piece*, I think you told me, was a tree?

Publicus. When I carried the work on ſome years ago, when we firſt began to build theſe ſort of ſhips, I did for my own amuſement make ſome trials of that nature: and if I remember right, the Gun-deck beams came to more than any of them---the Upper deck next; ---then the Orlop;---the Fore-caſtle; Quarter-deck; and, laſt of all, the Round-houſe.

Candidus. But this is not the thing I hinted at, *Publicus*; I wanted to know what the exact meaſure was of each tree, one with the other, for each deck ſeparately: beginning with the loweſt, if you pleaſe, firſt, that laying, as you informed me, under the deck on which we ſtand.

Publicus. Now I underſtand you---I will ſo. The neat content of each tree then, one with the other, if my memory does not fail me for

The Orlop, does not exceed	27	Cubical Feet.
Gun-Deck	34	
Upper-Deck	30	
Fore-caſtle	20	
Quarter-Deck	17	
Round-Houſe	11	

Candidus. This is what I meant; but you have not let me know, as yet, what the meaſure is of the leaſt tree, when in its rough ſtate, that you make uſe of;---I confine my queſtions only to the ſpecies of oak, you remember.

Publicus. Of the ſtraight timber, then, *ſixty* ſolid or cubical feet is the loweſt meetings; and of the compaſs timber *forty-five* the loweſt.

Candidus. The pieces of your *Gun-deck* beams appearing to be the largeſt, the trees they are made from I ſhould imagine to be ſomewhat conſiderable?

Publicus. Some of them are. I have known the whole contents, before they were cut out (or, as we term it, converted), to amount from 100 to 150 feet, which is not leſs than three loads of timber---fifty ſolid feet being accounted a load.

Candidus. What then becomes of the remainder of the tree, after that part is ſeparated from it for a piece of the largeſt beams, which you tell me does not exceed forty feet?

Publicus. That would be preſently anſwered, was you to ſee a rough piece of timber; but however, to ſatisfy your curioſity till then, you are to underſtand, that the ſlabs or outſides of the body of the tree, when of a ſufficient thickneſs, are cut or ſawed, either into boards or plank; and the top or ſpire-part of the tree, which is cut off, ſerves for various uſes, ſuch as pillars, carlings, ledges, &c.

Candidus. I ſhould be glad, before you proceed any farther, you would oblige me with an explanation of the terms you juſt now mentioned.

Publicus. As ſoon as timber is divided by the ſaw into different thickneſſes, it is immediately diſtinguiſhed by different terms: That which is an inch and half thick, is called plank: we enquire for it firſt by that name, till it comes to the thickneſs of five inches, when it is called thick ſtuff; ſo that from five inches and upwards, whether it be ſix, ſeven, eight, or nine inches, &c. it is ſtill denominated thick ſtuff; and all under an inch and a half thick we call board.

Candidus. I like your diſtinction very well;——but as to the other matters, *Publicus?*

Publicus. The upright pieces you ſee there, ranged along in the middle of the ſhip, ſupporting the beams, are the *pillars* I was ſpeaking of. Over our head, you obſerve *ſhort* pieces of timber lying *fore and aft*, or length-ways in the ſhip, from one beam to another, into which they are ſcored; *they* are termed *carlings:* thoſe ſmaller pieces than the others, lying *acroſs* the ſhip, from one carling to another, are the *ledges.*

Candidus. Thoſe crooked pieces at the *ſides* of the ſhip,---pray what are they?

Publicus. They are termed knees, from the near reſemblance they bear to the knee of an animal---You ſee they are faſtened to the beams and ſides; but, *them* ſtanding upright, which are faſtened to the *deck* and ſides, we call *ſtandards:* many of theſe, though ſome of them meaſure only ten or twelve feet, are converted from whole trees, being all together comprehended under the head of knee-timber---We look on this ſort of timber to be the moſt valuable of any, both from its dearneſs and ſcarcity, it being near half a crown a foot, one knee with another.

Candidus. Can you give a near gueſs as to their number, taking them in general one with another?

Publicus. I may venture to ſay, there are not leſs throughout the whole ſhip than between five and ſix hundred, few of them meaſuring more than twelve or thirteen feet, while again there are others ſo ſmall, that they amount not to *two* foot of ſolid timber.

Candidus. You have not acquainted me yet with the number of the *other* materials, which you ſaid were converted from the *top-parts* of your timber-trees. If you can form a tolerable judgment of them, I ſhould be glad to know.——You ſee, *Publicus*, how troubleſome I am to you. I told you before, if you remember, that I ſhould be very inquiſitive.

Publicus. As to the number of carlings and ledges for the Orlop, the Gun-deck, and the Upper-deck, there being few in the ſmall or lighter decks, I do not imagine there can be leſs in the whole, than between thirteen and fourteen hundred; beſides many others, which are of fir, diſperſed in different parts of the Upper-deck. The *carlings*, which are about a third part of this number, are in length from ten to five feet, and eight or nine inches ſquare——the *ledges* in length being from eight to five feet, by ſix inches ſquare or thereabout.

Candidus. So you apprehend, that all theſe ſmall pieces of timber---between thirteen and fourteen hundred, were produced from the tops of trees?

Publicus. I believe they were; but you are to conſider, that, beſides the ſpire-part, or top of the tree, there are ſome of them that have a branch, which when cut off is, for theſe purpoſes, equally ſerviceable with the other part.

Candidus. From the accounts you have given me of the application of the ſlabs which are ſawed from the body of the tree, and the uſes which are made of the limbs that are divided from it——I ſhould really imagine you were ſometimes put to great ſtraits to procure a little fuel for your families?

Publicus. Why, as to thoſe matters, the men generally take care of themſelves; it being an old ſaying, you know, “ That moſt people who work in the Vine-yard love to taſte of the juice of the grape:” ---beſides, 'tis our privilege as well as our wages.---We have alaways been allowed what chips we make, time out of mind.---We claim a little of the ſlab too, that comes off the pieces we work on, but then, it is only that which is fit for nothing elſe. If we can't make up a jag of wood once a day for our families, it's very hard. Strangers indeed may think as they pleaſe---but we never meddle with any that does not belong to us.

Candidus. You think ſo, I dare ſay, *Publicus*; but for the preſent, let us drop that ſubject.---As time will not permit us to go up ſtairs to ſee the officers apartments---give me leave to aſſiſt you with my hand, to help you out of the window here, where we came in at.

Publicus. Pray was you never on board of a Man of War till now?

Candidus. Once before at a launch, *Publicus*.

Publicus. It could not have been oftener, I dare ſay, by your talking of ſtairs and windows ---but I would have you, ſir, to take eſpecial care there of the *window-ſhutters* over your head, as you go out.---Now, what you call windows we call ports, and that which in all likelihood you might have looked upon as a window-ſhutter, is a port-lid with us;---there is no ſuch thing as going up ſtairs on board of a ſhip---up the ladder---or, up on the quarter-deck, or, down to the bread-room, &c.---*there* indeed I ſhould have underſtood you better.

Candidus. You are very obliging, *Publicus*, and have a great deal of patience with me: that I may profit from your inſtructive and agreeable company, is the utmoſt that at preſent I have to wiſh; and now we are on the land again, I ſhould take it as a favour, you would ſhew me where your maſts and boat-yards are.

Publicus. We ſhall be there preſently.—This is the boat-houſe.

Candidus. What a variety of boats are here! Some of them I perceive to be prettily ornamented. The outſides, I think, are made of boards, being under an inch and half thick, as I remember you told me. Pray what wood do you term it?—and that of which the ribs are made?

Publicus. The ribs, that we call timbers, are made in general from ſuch crooked pieces as I ſhewed you on the ſides of the ſhip, which, I obſerved to you, were the knees, though ſometimes we form them out of the ſhort arms or branches that we cut off from the tree. Theſe we term crooks, and where they have the qualifications of knee timber, are, in the boat-way, quite as ſerviceable. The boards you mention, being of a finer grain than our Engliſh oak, are called wainſcot; ſometimes, indeed, we cut them from a log of our common oak, and when it is fine grained, clear and well ſeaſoned, makes excellent board, no way inferior to wainſcot.

Candidus. I could wiſh, *Publicus*, you had the ſame opportunity of entertaining me with the ſight of the inner ribs of a ſhip, as you juſt now had of a boat.

Publicus. A quarter of an hour's walk will give you all the ſatisfaction you can require.

Candidus. Let us walk quite round it firſt.—Is this the ſhip you meant?

Publicus. It is; but we do not call them ribs, we diſtinguiſh them by the name of timbers, in the ſame manner we do in a boat. Theſe timbers keep the ſides of the ſhip together: it is to them the planks both within and without board are faſtened.—Why, you ſeem ſurpriſed!

Candidus. Good God! till now I imagined you had only here and there a timber, but they ſtand ſo thick from one end of the ſhip to the other, there is hardly room any where to put your hand in edge-ways. I have been told, that King Charles II. took particular delight in the art and improvement of ſhip-building; and well he might, when his Majeſty knew his beſt defence laid in his ſhipping. I have heard too, that he thought it not beneath his royalty ſometimes to viſit one or other of his Docks. What an amazing and ſtupendous machine is here! Surely the art of building ſhips ought to be held in the higheſt reverence. I am not to ſuppoſe that one of theſe timbers, from the top to the bottom, is made only from one tree, *Publicus*?

Publicus. No, they are made from ſeveral.

Candidus. Did you ever hear what number of trees a ſhip of this claſs took up in the whole?

Publicus. No, I never heard,—nor was ſuch a queſtion, I believe, ever aſked before. It is altogether impoſſible to tell, there being ſometimes a number of them, which, proving defective, are obliged to be thrown by.

Candidus. I am afraid the many queſtions I aſk become troubleſome to you, *Publicus*; I am over-curious; but if you can, only gueſs at the number.

Publicus. Why, I do not think there can be leſs in the whole than fifteen or ſixteen hundred.

Candidus. Fifteen or ſixteen hundred!

Publicus. I ſay there cannot be leſs: You do not conſider that all our thick ſtuff, from five inches thick and upwards, is cut from large timber-trees that often contain three or four loads; beſides, I warrant that even in the bottom and ſides of this ſhip, the timbers alone, excluſive of the head and ſtern, will take up not much leſs than ſeven hundred.

Candidus. My wonder ceaſes, *Publicus*; but I obſerved there, withinſide, that you cannot make all your timbers without putting of pieces to them at the ends; what is the meaning of that, pray?

Publicus. We can help it, if we pleaſe, but we do it on purpoſe. Thoſe pieces are called chocks, they are ſayed (or you will better underſtand me when I ſay joined) to the ſcarphs at the heads and heels (or upper and lower ends) of the timbers.

Candidus. Pray what is a ſcarph?

Publicus. I believe I can deſcribe it no better to you, than by deſiring that you would put the ends of your middle fingers againſt each other, the palm of the hand being uppermoſt—ſo. You are in the next place to imagine, that a little notch or ſcore is made juſt at the firſt joint of each finger, and from thence you are to ſuppoſe, that the fleſh between that notch and your finger nail is taken away, ſlanting—they would then repreſent the ſcarphs that are cut in the timbers, as above. The pieces then, which ſay, or join into, thoſe ſcarphs, to which they are faſtened, we call chocks—they are in general above three foot long, and fourteen or fifteen inches broad, and pretty near as much in thickneſs, before they are faſhioned out; ſome there are as long again. Theſe are all ſupplied from the waſte of the timber, in the cutting of them out the ſecond, or moulding-way.

Candidus. How many do you think there may be of theſe chocks?

Publicus. Great and ſmall nearer *five* than four hundred.

Candidus. Was the neat meaſure, or, as you term it, neat content of the timbers aforeſaid to be divided by the number of trees expended therein, what do you judge might be the amount for each timber, one with the other?

Publicus. This is another of the very ſtrange queſtions you have been aſking me; but however, I will endeavour to reſolve you, as near as I can.---I ſhould imagine that, one with the other, they could never exceed twenty-four cubic feet. But you are to obſerve here, that I have not included the little ſhort top-timbers over the ports, theſe being generally ſupplied from the top of the tree, that remains, when a large timber has been taken from the body of it; though ſometimes, indeed, the top-ends have been large enough to produce ſome of theſe ſmall timbers.

Candidus. Is this ſhip intended to carry as many guns as that which we were firſt on board of ?

Publicus. The ſame. She was a third rate of 74 guns, her complement men.

Candidus. I now recollect, that, in the ſecond or third day's converſation we had on board, you gave it as your opinion, that there were as many trees, one with the other, whoſe ſolidity before they were wrought were above eighty-five feet, as there were of thoſe which were under eighty-five feet: and when you remarked in our diſcourſe upon the beams, that you had known ſome of them (meaning the pieces of which the larger beams are compoſed) to have been cut out of trees that amounted to between 100 and 150 feet of timber; you muſt remember, I aſked this queſtion, What then became of the remainder of the tree, after that part was ſeparated from it for a piece of the largeſt beams, which I think you told me did not exceed forty feet, when wrought ?---The reply you made to the queſtion was this, that I ſhould have a much clearer conviction as to that point, when I ſaw a rough piece of timber---I ſhould be glad, therefore, *Publicus*, you would ſhew me one of them.

Publicus. There are a great many of them this way.---See---this is one of the top-ends I was ſpeaking about, which you perceive to have been cut off from the head of the tree yonder: there are ſome, you ſee, that, beſide the ſpire-part, have an arm growing out.

Candidus. There are ſome, I obſerve, but they are very few: ſure you can never be ſupplied with all thoſe materials of carlings, ledges, and the pillars you talked of, from the tops and arms of theſe trees ?

Publicus. Now we ſhall be no longer interrupted, as the bell has rung the people out to dinner.---I deſign in the next place to ſhew you ſome of the timbers, the beams, and other things, while they are cutting out at the ſaw-pits.

Candidus. You are very good, *Publicus*.---There is one of the trees, I ſee, from which they have ſawed off a ſlice, almoſt from one end to the other---on both ſides.

Publicus. This we call *ſiding* of a piece; and when the log is ſawed quite through, it is ſaid to be cut down. the *firſt*, or *ſiding-way*.

Candidus. I underſtand you; and thoſe outſide pieces I preſume to be the ſlabs you told me of; though indeed I might have called them waſte-pieces, but I think very improperly if I had, for they ſeem to be of a pretty good ſubſtance.

Publicus. It was from ſuch ſlabs as theſe, that I was telling you before, we cut a vaſt deal of two and three-inch plank---I bought a rule for you yeſterday, as you deſired me;---there ſir,---if you pleaſe, you may meaſure it yourſelf---you will find what I ſaid to be true.

Candidus. Why, it is big enough, I believe, indeed; it meaſures ſix or ſeven inches thick in ſeveral places.

Publicus. Now, after this ſlab has been ſawed or cut to the thickneſs of two or three inches, if you remember what I ſaid, it then becomes plank: and the outſides of theſe planks, the waſte that is good for nothing elſe, is what the workmen are allowed, the ſame as the chips, which they lawfully make, with their working-tools.

Candidus. But, admitting there was another plank ſawed out of the ſlab, which would then be left, after cutting off the firſt plank (for it ſeems to be thick enough to admit of it), there would remain an outſide ſlab, nevertheleſs.---Pray, what is the contract price for the different ſorts of oak plank? do you remember?

Publicus. The prices, I think, are,

	Inch.		£.	*s.*	*d.*	
for *Dantzick*	4	Plank, about	8	10	0	*per* Load, or 50 Cubic Feet.
Engliſh	4	Plank,	6	10	0	
	3	Plank,	5	10	0	
	2½	Plank,	4	17	6	
	2	Plank,	4	4	0	

Candidus. The oak timber, crooked and ſtraight, one tree with another?

Publicus. About the price of the two-inch plank.

Candidus. Pray now, *Publicus*, if all that ſlab we ſee there, was to be cut into as much plank as it would allow of, what do you apprehend might be the ſolid content of it?

Publicus. Not leſs than ſeven feet, which, at 4*l.* 4*s.* per load, comes to above twelve ſhillings.

Candidus. If you had more of that ſort of plank than you could well diſpenſe with, would not that thick part towards the ground-end there, make a few of thoſe ledges, which you mentioned to be about four or five feet long, and no more than five or ſix inches thick; but, now I recollect, you hinted to me, that they were made from the top-ends.

Publicus. There is, you ſee, a piece of plank at the other pit, that was cut out of ſuch ſlab as I ſhewed you,---they are cutting it into quarter.

Candidus. You have not informed me yet, what that ſaid quarter is.

Publicus When planks are laid flat-ways, and ſawed from one end to the other, ſo that they meaſure both ways alike, they are then ſaid to be cut into quarter; as for inſtance, a three-inch plank, cut after this manner, will become three-inch quarter, and is three inches ſquare. We uſe a great deal of this quarter-ſtuff.

Candidus. There is a piece with a pattern upon it yonder; is that to ſaw one of the ſhip's timbers by?

Publicus. That we call a mould; now when it is ſcraped, or marked by the piece, we ſay the timber is moulded; and when the ſaw has traverſed round that ſcrape on both ſides, then the timber is ſaid to be cut the ſecond, or moulding-way.---Here, ſtay, I will ſhew you one almoſt cut out.

Candidus. I ſee---at that pit. Why---here is a prodigious deal of outſide and ſlabs the ſecond-way of the piece, as you term it; what do you do with all this, *Publicus?*---What large chumps there are come off the ends! Why, I warrant it, there is five or ſix cubic feet in each of them!---Here---in the hollow part too,---what a large piece of wood! Do you find no uſe for them?

Publicus. Oh, yes---they find a uſe for them all: it is from theſe pieces at the ends we make thoſe chocks I told you of, that ſcarph into the timbers---and theſe belly-pieces we cut into linings for the port-lids. Indeed, when the grain runs kindly, we turn the belly-pieces up edge-ways, and cutting them into proper ſcantlings, they ſerve for boat-timbers.---From the end of this tree, is an arm cut off about ſix feet long.

Candidus. I perceive where it lies, *Publicus.* Is this one of the crooks you was ſpeaking of?

Publicus. This is one of them;---you ſee, how it grows to the work.

Candidus. That you are the beſt judge of; but I think you ſay theſe crooks ſave the knees, which I remember you took notice to have been a very ſcarce commodity. Pray then will not theſe belly-pieces ſave the knees likewiſe, if they are applied as you would have me believe?

Publicus. Certainly; the conſumption would be a great deal more, to be ſure, were they not applied to that uſe.

Candidus. I obſerve, there, a ſided-piece that is cutting into board; now, would not your ſlabs, or outſides, ſupply you with a great many ſuch as they are? You tell me planks may be ſawed from out of your ſlabs;---by the ſame rule, boards evidently might, from the reaſon you have before given me, of their being of a leſs ſubſtance.

Publicus. To be ſure they might, was there leſs occaſion for plank than there is.

Candidus. Then I am not to conclude, that ſuch pieces of whole ſlab, as I now ſee, are at any time applied wrongfully; but that it is the mere outſides, only, of the plank or planks that are taken, cut, or ſawed from the ſaid ſlabs.---Is that what you would have had me underſtood, *Publicus*, when the workmen, you ſaid, claimed no more than the uſeleſs part of the ſlabs which came off the pieces they were to work on?

Publicus. I obſerved to you it was only the uſeleſs part.

Candidus. Can you ſhew me any of the knees, carlings or ledges, you ſpeak of, that are cutting any where?

Publicus. We will walk to another part of the yard, where your curioſity may be gratified.---There you ſee is one of the very ſame ſort of knees I ſhewed you on board;---it is ſided, and they are going to cut it out the moulding-way; it is marked by for that purpoſe.

Candidus. Why, the ſlabs in theſe ſort of things are prodigious, one would not imagine it. Was the ſolidity of this knee when wrought, to be compared to what it was when unwrought, what a great diſproportion there would be! I dare ſay, it would not meaſure above a quarter part of it.---What uſe do you put the ſlabs of theſe knees to, *Publicus?*

Publicus. They, being no ways ſerviceable in the yard, are ſent either to the kilns to be burnt, or the workmen do apply them to their own uſe.

Candidus. What a pity it is, to ſee the better part of ſo valuable a material doing the office, merely, of common fire-wood! becauſe indeed there appears to be no uſe for it in the King's yards.

I think you told me, the whole number of knees, great and ſmall, in a 74 gun ſhip, came to between five and ſix hundred; conſequently then the ſlabs amounted to above a thouſand. Now, provided the wherry-builders up the River had the management of the ſaid ſlabs, it might ſeem a reaſonable queſtion, whether they would not have culled out of them as many ſmall pieces of oak very uſeful in the boat-way, as would have amounted to between two and three thouſand.---To this there can be no man whatever, of the leaſt obſervation, but will readily give his aſſent, had he but once in his life-time popped his head into a boat-builder's yard, or have ſtepped into a common London wherry. The figures marked on my rule acquaint me that this piece here is ſix inches thick. Is this the timber you diſtinguiſh by the name of thick ſtuff?

Publicus. We do. It is lined out for ledges, and is to be ſawed according to thoſe lines all the way, from one end of the piece to the other; now, where you ſee it is chalked acroſs, there it is to be cut aſunder.

Candidus. I underſtand, from what you ſaid when you favoured me with an explanation of the pillars, the carlings, and ledges, that they were all produced from the arms and tops of trees; notwithſtanding which you tell me now, that the broad piece, which lies there, is deſigned for ledges.

Publicus. This muſt be the caſe ſometimes, no doubt of it, when we cannot get any thing elſe to make them from: but if the top ends are ſcarce, other ſtuff muſt be had, to ſupply the want of them;---the ſervice muſt not ſtand ſtill.

Candidus. To be ſure, the ſervice ought not to be retarded at any rate. But how can a ſcarcity of top-ends be admitted, *Publicus*, if every tree, as you have informed me, had one, or ſometimes two of them? Even allowing no more than one to every oak-tree, there being in the whole fifteen or ſixteen hundred uſed in a ſhip of 74 guns, they would exceed the number of carlings and ledges, which you ſaid were only between thirteen and fourteen hundred, and ſome of theſe tops, if one may be allowed to form a judgment of them in the general, from what I have noticed of their length ſince I firſt came into the dock, they might as well make two as one.---There is one of the ſame ſort of knees we juſt now ſaw, cut into a great many planks; what are they for, pray?

Publicus. They are not planks, we term them flitches, boat-flitches, out of which the timbers for the boats are made, if you remember.

Candidus. Do, delineate the form of one of the timbers with a bit of chalk.

Publicus. ---There;---that is pretty near the mark, as the mould goes, for a floor timber.

Candidus. To what ufe do you apply the wafte? I think it by far exceeds the quantity of matter there is in the timber itfelf.

Publicus. It does fo;---but we have no ufe for it here.

Candidus. Why, how ferviceable that muft be, too, in the fmall-boat-way, efpecially if it was made a little thinner: do not you think fo, *Publicus*?---The wafte, when it was cut out, would make feveral little ribs for them.

Publicus. I fhould wrong my judgement very much if I did not: all I fay is, We have no ufe for it here.

Candidus---This way:---I perceive a great many angular pieces, which appear to have been cut off, one from the other; what do you ftyle them?

Publicus. They are intended for chocks, at the head and heels of timbers. I defcribed their ufe before.

Candidus. I remember you did; but, if I miftake not, you afterwards informed me, at the other part of the yard, that thofe chumpy pieces of the wafte I took notice of, which came off towards the ends of the ribs or timbers, fupplied you with what chocks you wanted.

Publicus. It is very true, but if they burn thefe chumpy pieces, as you call them, at the kilns or boiler (where we fupple the planks) that would do for chocks, and there fhould not be a fufficient number of caft pieces (thofe in which fome defects have been difcovered) to fupply the deficiency, we are obliged to have recourfe, fometimes, to the converting of whole trees for that purpofe---which have been flabbed, or, as we fay, fided.---To be fure, it is out of all manner of difpute, if the chocks from our timbers, or ribs as you call them, could be preferved, that many a good oaken-tree would be faved, confidering the great number of compafs pieces that are cut out of trees nearly ftraight, for the body of fo large a fhip as that I fhewed you.

Candidus. And do not you reckon it a very extravagant practice, to burn fuch valuable ftuff at your kilns?

Publicus. We do it to fave the bavins;---it is accounted good œconomy here.

Candidus. It may be in your yards;---but, I apprehend, it could only be meant to burn fuch ufelefs wood and old timber as was fit for nothing elfe.---Is there ever a one of the kilns near at hand?

Publicus. On the other fide of the brow, there---where the fmoke is.

Candidus. I fee, *Publicus*, we muft go over that bridge then.---So, this is the place where you boil and fupple your planks. Sure this piece of flab can never be deftined to be burnt! Let me meafure it. Why, it is a matter of twelve feet long, and in the middle here, above fifteen inches wide! Would not this have made a good plank? It is very little fmaller, I obferve, than fome of thofe you fhewed me at the firft pit we went to.

Publicus. Yes, that flab will make a fpecial three-inch plank, nine foot long at leaft.

Candidus. How many cubic feet, then, would that have been?

Publicus. As it would have held fourteen inches broad, the net content would have been about two feet and a half.

Candidus. And would not that have ſaved a like quantity of plank, that you contract for? If you have any uſes for ſuch ſhort pieces, I think it certainly would: for, did the ſupplies you raiſe from your ſlabs, prove deficient---*the ſervice muſt not ſtand ſtill*, you know, *Publicus.*

Publicus. We have uſes enough for them;---a great many, to be ſure.

Candidus. I have the memorandum here of the different prices of plank you gave me; from which I find, that ſuch a plank at 5*l.* 10*s.* per load, would have come to about five and ſix-pence.

Publicus. And had you bought that plank at any deal-yard in P-----n, you muſt have given three half-crowns for it.

Candidus. I think you ſay, there would have been about two foot and a half: Pray now, what do you account common fuel-wood in general to be worth by the foot, one with the other?

Publicus. Not above two-pence; but there is, perhaps, four feet in the whole ſlab.

Candidus Admitting there is, the worth of the whole ſlab for fuel-wood could but have amounted to eight-pence, and the plank, conſidered by itſelf, not to ſix-pence; ſo that it ſeems to appear to me, as clear as two and two make four, that the Government on ſome occaſions do pay for fire-wood ten times the value that we buy it for in common; and I dare ſay, you think ſo too.

Publicus. You will excuſe an old man's caution of giving his opinion, on ſo ſlight an acquaintance.---I cannot tell, Sir, as you have minuted down every thing as faſt as I told it you, but what you may be ſome gentleman or other *incognito*,---for aught I know, one of the C--------rs of the N---y, though I am not conſcious neither of having ſaid any thing to be afraid or aſhamed of. You was pleaſed to put ſuch and ſuch queſtions to me, and I have returned no other anſwers to them than what I think myſelf capable of juſtifying in any place whatever; and, for the little trouble I have had at times in going backwards and forwards, to be ſure, you have handſomely rewarded me. Many people, ſtrangers to our Dock-yard, have thought that there has been ſometimes a world of miſchief done in it; but---I can aſſure you, Sir, the officers all do their duty, from the higheſt to the loweſt.---That board there, with a printed paper ſtuck upon it, will preſently let you know what ſome of our orders are.

Candidus. Let me ſee---'By the principal Officers and Commiſſioners of his Majeſty's NAVY.

'Whereas there is reaſon to apprehend, That the officers of his Majeſty's yards, &c. &c. do connive at the cutting up ſerviceable timber, &c. for private uſes; when by an order of this Board, dated the 16th of Sept. 1686,

"No officer is to employ the King's ſhip-keepers, labourers, or workmen of any kind, in their houſes, ſtables, or gardens, which is particularly prohibited by the ſeventeenth article of the Lord High Admiral's inſtructions to the Clerk of the Checque, &c. &c;"

'When, by a printed publication, dated the 2d of September 1695, ſigned by the Right Hon. the Lords Commiſſioners of the Admi-

‘ miralty, upon information of the like evil practices, the reſpective
‘ officers, which then did, or ſhould hereafter, belong to his Majeſty's
‘ yards, were ſtrictly charged,

“ Neither to order or permit the cutting out, or converting to chips,
“ or other private uſes, any new ſlabs, but-ends, top-ends, or any
“ new or old timber, plank, or other ſtuff whatſoever; and if any
“ officer or workman ſhould embezzle any of his Majeſty's ſtores, or
“ commit any other abuſe, contrary to the rules and directions which
“ had been then or ſhould hereafter be given by the Commiſſioners of
“ the Navy, they ſhould not only be diſmiſſed, but puniſhed with
“ the utmoſt ſeverity of the law.”

‘ It is hereby again enjoined, That all and ſingular the officers,
‘ workmen, labourers, and others employed in his Majeſty's yards, do
‘ duly and punctually obſerve and execute all the particulars contained
‘ in the aforeſaid orders (as far as they relate to them reſpectively),
‘ as they will anſwer the contrary at their perils. And it is further
‘ directed, That no officer in his Majeſty's yards do preſume to burn
‘ any old ſhip-timber, offal-timber, or old ſtores, in their houſes; or
‘ that any inferior officers, workmen, labourers, or men (or any of
‘ them) belonging to the Ordinary, do carry out of any of the yards,
‘ or in a boat or boats from ſhips afloat, any old ſhip-timber, or joiner's
‘ works of cabins, or old ſtores of any kind, upon the ſevereſt penalties
‘ which can be inflicted by this Board, and being proſecuted with the
‘ utmoſt rigour of the law, &c. &c. &c.

‘ Dated at the Navy-Office, the 13th of *Sept.* 1721.’

And theſe orders are conſtantly hung up, as they are directed, in the moſt public places of the yard.---They are very ſtrict indeed; although one would not imagine, from the accounts I have been favoured with from you, that there could have been any neceſſity for a printed publication relating to theſe matters above ſeventy years ago, viz. in Sept. 1695; or at this time any occaſion to repeat orders of ſo long ſtanding; much leſs to print any thing in addition that might tend the more to enforce them.

Not that I have the leaſt cauſe whatever to cenſure your conduct in this affair; as it would have been in no wiſe prudent in you to have expoſed any undue practices committed by the body of which you appear to me to be virtually a member.---I was a ſtranger to you; therefore, by all means your circumſpection muſt be approved: but, notwithſtanding the pains you have taken in the general, to ſet off the œconomy of your dock-yards to the beſt advantage, it ſeems with me almoſt next to an impoſſibility to imagine, that amidſt ſuch an infinite variety of ſmall materials, diſperſed up and down the yard (which may be conſidered in the light of ſo many temptations to allure a man from his duty), that even the ſhadow of good huſbandry can be long preſerved, in a place where it appears to be altogether ſo incompatible with the workman's intereſt.

Publicus. And theſe diſorders and inconveniences might be eaſily put a ſtop to, would the Government take it into conſideration only to allow the people ſomething in lieu of their privilege.

Candidus. But do you apprehend, that on the granting of ſuch an allowance as would be agreeable to the men, it could be of any advantage to the Government?

Publicus. From what I can perceive of the matter, and I have been in the ſervice a-going now three-and-ſixty years, man and boy---I do ſincerely believe the Government can never be any loſers by it.

Candidus. I ſee you are ſtill upon the reſerve.

Publicus. Not ſo much, I hope, as to give any offence.

Candidus. To relieve your fears then, and take off any groundleſs ſuſpicion which may deprive me of a further converſation with you, ---I ſhall at once let you know, that I am neither a C-------r myſelf, nor am I employed by e'er a one, or by any other perſon whatſoever, to diſcover any thing here in your yard, that can be productive of the leaſt harm; on the contrary, ſhould the inſtruction and intelligence I receive from you furniſh me with ſufficient matter to work on, I have reaſon to hope that my viſiting your yard may be productive of ſome good.---I am a private gentleman, who having a great deal of leiſure time on my hands, would fain employ ſome part of it in ſuch a manner as might tend to promote the good of my country and the happineſs of my fellow-creatures.---Therefore, I doubt not but by this time your apprehenſion will of courſe ſubſide, and that henceforward you will believe yourſelf to be in the company of a man who is your friend, and who, you may reſt aſſured, will be ſtudiouſly bent to render you and the community here what ſervice he poſſibly can.

Publicus. Sir, the community are obliged to you for your kind intention.---Heavens proſper you in all your undertakings! ſays an old ſervant to the public, now a-going into his ſeventy-eighth year. And ſince I underſtand what latitude we are now in, you may command me, Sir, in whatever queſtions you have a mind to aſk, for I ſhall no longer keep any thing from you, that may deprive you of an opportunity of doing us a friendly office.

Candidus. I think the Captain, your old acquaintance, informed me of your being one of the ſuperannuated officers in this yard. Pray in what ſtation have you been employed, *Publicus*?

Publicus. There is not any one branch in the ſhipwright-way but what I have had the honour of bearing a command, either as principal or deputy, ſuch as moulding, lining, meaſuring, and likewiſe carrying on the work in quality of quarterman for many years together, from which laſt ſtation I was (thanks to my Lord E------T) ſuperannuated at five-and-twenty pounds a year.

Candidus. I ſhould imagine then, from the great knowledge and experience you have undoubtedly acquired, that you muſt be very capable of conveying ſome uſeful hints.

Publicus. Although my legs refuſe to do their office, and my body is weak, yet I thank God my head is pretty clear:---I have a tolerable memory.

Candidus. You will then oblige me much, by making a little uſe of it, *Publicus*. Pray, for I find you had many people under your command, did you not find it extremely difficult to prevent your men from doing bad things ſometimes?---I mean in what relates to their privilege of carrying out chips?

Publicus. Extremely difficult indeed, Sir, nay, 'tis altogether impoſſible.---For inſtance, ſome of my hands, we will ſuppoſe (for I had never leſs than eighteen or twenty at a time), are employed in one part of the ſhip, others in another part, and ſo again in different parts of the yard, preparing their work ready to bring on board;---two or three gone to their cheſt for tools,---others to the grind-ſtone, and ſo forth;---myſelf obliged to go from one end of the yard to the other, either to look out or to mould the materials I have occaſion for. Now, Sir, till a quarterman can be in all theſe places at one time, it is morally impoſſible to expect he can do his duty as he ought.---This is the truth of the matter, I can aſſure you.

Candidus. There ſeems to be a great deal of reaſon in what you ſay.

Publicus. Now, Sir, if you pleaſe to give me leave to remark one thing in regard to the hardſhips the working-people labour under, you will then perhaps the more readily excuſe them from doing what we cannot always prevent them from. I remember the time when I was between twenty and thirty, that a vaſt deal of timber was then hewed, which is now ſawed.---There was abundance of chips made; the men were never in want. Ship-building, Sir, is now arrived to a much greater perfection than it was formerly, ſo that where the artificer had commonly three or four, or ſometimes ſix inches and more to chop away, he has ſeldom now above an *inch* to work on.---The materials are ſo fine-drawn now-a-days, that if a man was not allowed a bit of ſlab, &c. now and then, I queſtion whether or no he could be able to make above a couple of bundles in a week.

Candidus. According to what you ſay, if the workman could not find means to come at any more wood than what he lawfully made by his tools at this time—when the materials are ſo finely drawn---he would then labour under great hardſhips indeed; but he can labour under none while we admit of his ſupplying his family with what he wants.

Publicus. But ſtill, for all this, there is not near the quantity made, as there was in former times.---To be ſure, if what was accuſtomed to be hewed is now ſawed, and that which was their privilege thereby taken from them, it cannot be expected, but that they will make it up one way or the other,---that they will look out for themſelves.--All that they require is but fuel for their own families.

Candidus. I ſeem to be of your opinion, if the workmen at this time believe themſelves to be abridged of any part of the timber they formerly were allowed, as their antient right and common privilege, that they will take all the opportunities they can to repay themſelves with a like quantity.

Publicus. And even was there a great deal more timber waſted than what there formerly was, it could be a matter of no great aſtoniſhment, ſince proviſions of all kinds, and every common neceſſary of life, are ſo extravagantly dear, to what they uſed to be.

Candidus. Pray, what is the preſent day-pay of the ſhipwright and labouring-man? and how long ago is it ſince it was ſettled?

Publicus. The day-pay of the working-ſhipwright is two ſhillings and one penny,---the quarterman, two ſhillings and ſix-pence,---the labourer, one ſhilling and one penny; and the other workmen in proportion: Their wages were ſettled in the reign of King *Charles* I. about the year 1636.

Candidus. And has there been no augmentation of wages ſince that time, for near one hundred and thirty years?

Publicus. None that I ever heard of, to the *working-men* and *inferior officers*.

Candidus. I think it is a great pity ſo uſeful a body of men were not better encouraged. For my own part I muſt confeſs, it would be no manner of ſurprize to me, was I to hear, that *half* the timber which came *in* at one end of the yard, went *out* at the other.

Publicus. Nor would you be ſurprized, perhaps, was you to hear, there were *two-thirds*; for I would have you conſider, Sir, that his Majeſty's Yards do conſtantly ſupply above *four thouſand men and their families* with wood for fuel.

Candidus. Is it poſſible! I wonder then how we can get timber to build ſhips, if this be the caſe.---Was you to pay for your fuel-wood out of your own pockets, where do you apprehend the damage would come, for one year?

Publicus. I do think, it could not fall ſhort of ten or twelve thouſand pounds.

Candidus. Ten or twelve thouſand pounds!---And what do you judge may be the expence to the Government for all this wood, at prime coſt?

Publicus. Perhaps eight or nine times as much: for as the Government pay four pounds a load, one load with the other (50 cubic feet), for all the timber they uſe, it cannot be leſs in proportion to the difference, than between *two-pence* and *nineteen-pence*.

Candidus. According to your account, admitting that the expence, was you to pay for ſo much common fire-wood yourſelves, would coſt not leſs than ten thouſand pounds,---the annual charge to the Government for ſuch a conſtant ſupply, muſt amount to the ſum of eighty or ninety thouſand pounds.---I do not ſo much wonder now, at the ſcarcity of timber!

Publicus. But then you are to conſider, Sir, that in this calculation we include the old as well as the new timber; ſuch as that we are allowed to take from ſhips that are broke up or repaired; then again we reckon in all the decayed timber along with it.

Candidus. You ſeldom, I find, break up any Men of War in your docks, as the benefit accruing to the Government that way, will hardly reimburſe the charge of the workmen's labour: No, you rather and more prudently ſell or make break-waters of them, which at the ſame time they are a ſecurity to your wharfs, prove a convenient habitation at one or other of your ports, for the labouring-people there: and in regard to what wood you are furniſhed with, that is taken from ſhips under repair. If the quantity of ſlab-timber expended at the kilns (ſome of which you have proved to be worth twentypence per foot) was not very inconſiderable, I ſhould be really inclined to believe, that the deduction which you ſuggeſt ought to be made on that account from the calculation aforeſaid, would be only trifling.------I ſuppoſe, you muſt have heard on what conſideration the artificers would conſent to give up their privilege?

Publicus. To be ſure, Sir! The people would gladly relinquiſh their property in the chips, on raiſing their pay from two ſhillings and one penny to half-a-crown a day:-- there may be ſome of them, perhaps, who make ſix-pence a day of them, but then when the great labour and hazard of procuring them is conſidered---nobody would object. Indeed, ſince the EARL OF EGMONT hath been ſeated at the Admiralty, that we have been indulged in working one tide extra in the ſummer, without which conſideration ſome of the beſt of our men would either enter into the foreign ſervice, or be deprived of bread to feed their poor little babes with; I ſay, were we aſſured of a continuance of *this indulgence* (although indeed, we give our labour for it), I am almoſt certain, that the artificers, to a man, one and all, would hold up their hands for the advance of *three-pence* a day only.

Candidus. If a conſideration of three-pence a day was to be added to the pay of the ſhip-carpenters, &c. what would ſuch additional wages *per annum* amount to for all his Majeſty's Yards?

Publicus. I think I have been told, it would come to between twenty and thirty thouſand pounds---though I never gave myſelf the trouble to reckon it up.

Candidus. I fancy not, as the number of people to be allowed three-pence a day muſt be near half as many again as you mentioned, to come up to that ſum.---Pray be ingenuous enough to tell me who the people are that do *partake* of this privilege;---remember what you ſaid, *Publicus*, you would conceal nothing from me.

Publicus. ANCIENT USAGE and CUSTOM hath given it to the *Shipwright*, the *Caulker*, the *Wheelwright*, *Block-maker*, *Oar-maker*, *Houſe-carpenter*, *Joiner*, the *Labourer*, and the *Scavelman*, *Quarter-boys*, and *Oakum-boys*, who are all, in ſome degree or other, connected with the SHIPWRIGHT.------*Opportunity* hath given it to many more.

Candidus. I now underſtand, that the number you before mentioned to have been ſupplied with fuel (which you ſaid were above four thouſand), conſiſted as well of thoſe who had no right, as of them who had; you will then let me know, what the number of thoſe are, who, as expreſſed above, do claim a right of privilege.

Publicus. Alas, Sir, it is impoſſible for me to tell, being a thing entirely out of my way.---I can only gueſs at it.---There may be four thouſand, or not quite ſo many---perhaps not above eight or nine and thirty hundred in all.

Candidus. Admit there is eight or nine and thirty hundred, it comes to but about fifteen thouſand pounds *per annum*; to be given in lieu for as much timber, take the good with the bad, as moſt likely coſts the Government five times as much.

Publicus. And if the ſaving of the time that is now loſt in conſequence of the workmen's privilege, was to be looked upon as the ſaving of ſo much money; inſtead of fifteen thouſand pounds, the charge to the Government for additional wages would never come to ſeven thouſand pounds.---I am ſure, you may very ſafely reckon near two-pence a day's loſs time to each man, one with the other, and not overdo it neither.---There commonly goes away three quarters of an hour to make up their bundles, if not more.

Candidus. This may very likely be true; but then, will not many objections naturally ariſe; ſuch as---What muſt we do with all theſe chips? and, Will not the yards be ſo peſtered with them, as to prove an embarraſſment to the ſervice,---a continual annoyance to the workmen? Will not ſuch a regulation draw along with it a freſh expence? Muſt we not be under the neceſſity of entering an additional number of labourers, on that account, to carry away, to ſort, to lay up theſe chips? If this is to be the caſe, the remedy, in all human probability, may be worſe than the diſeaſe.

Publicus. Suppoſe there were a few more labourers to be entered;---that the workmen were ſometimes incommoded; and the ſervice perchance put out of order;---I ſay, Sir, admitting all this to be true, I am bold enough to declare, that even then, the remedy could not be worſe than the diſeaſe; but this I am apt to think can never be the caſe, as will be ſhewn by an endeavour to remove all ſuch objections.

Notwithſtanding, Sir, I have hinted before, that many of the materials are at this time, to the manifeſt diſadvantage of the working-people, cut with a ſaw, which in my memory uſed to be hewn with an axe, yet, was the privilege entirely given up, there would then be a far greater number of materials ſawed than ever, by which means both a great deal of time and timber muſt of courſe be ſaved,---the workmen no longer having any intereſt in the ſlabs, or waſte. Therefore, the queſtion, on a due conſideration of the matter, will not be, What muſt we do with all theſe chips? but rather, What muſt we do with all the materials from which they were accuſtomed to be made? For if we admit, that great part of what is now cut up for the purpoſes of fuel-wood, to-day, were ſlabs, were top-ends, &c. yeſterday, the foregoing queſtion will then be a very natural one, viz. What muſt we do with the materials that are converted from ſuch ſlabs, ſuch tops, &c. &c?---The anſwer is very obvious,---Do the ſame with the ſmall materials, as you would with the large ones; uſe them, if there is a preſent occaſion; if not, lay them by till there is; and if at any time the number is found to exceed the exigencies of the ſervice an opportunity will always lie open for diſpoſing of them to the beſt advantage. Now, when you come to conſider that great part of the wood which is deſtroyed for fuel, inſtead of being chopt off with the axe, &c. will, as I have before obſerved to you, be cut with a ſaw, by which means the outſide, or waſte, as it is commonly called, will come off whole, and entire; I am well perſuaded (if good huſbandry is purſued in the management of it), there will be little leſs than three parts out of four of the quantity of wood now applied to the private uſe of the workmen, but what will then become ſerviceable in ſome degree or other, either in the public or private way; conſequently, then, little more than one quarter part will be fit, only, to be conſumed at the fire---ſuch as decayed timber, uſeleſs ſlabs, and the ſmall chips made by the workmen in the courſe of their labour, either by the axe or adze, &c. Now, how this ſhould prove of any hindrance either to the workmen or to the ſervice, I am at a great loſs to underſtand, or whether there will be any neceſſity to increaſe the number of labourers; who, it is very well known, do at preſent waſte a great deal of time, which they will then have no longer occaſion for.

Candidus. Your anſwer to the foregoing objections do in the general pleaſe me very well, *Publicus*; yet, methinks, where you ſpeak of the proportion between the ſerviceable and the unſerviceable part of the timber, you are not quite ſo ſatisfactory as I could wiſh.

Publicus. That, Sir, I cannot help.—I gave it but as my opinion, yet it was an opinion founded on long experience, from a critical obſervation of theſe matters; and which has convinced me, that, in regard to the oak materials in general (of which there is more waſte than in any other ſpecies of timber), out of the whole quantity which the Government pays for, there is not above a third part of it which does actually come to uſe. Yet, if this will not do, if nothing but demonſtration will ſatisfy, let then an experiment be forthwith made, in all his Majeſty's Dock-yards, only for the ſpace of one twelvemonth. Let then the ſolidity of all the wooden materials that are uſed either in building, repairing &c. be accurately meaſured, as ſoon as they are fixed in their places, and the total of this account for the whole yards will (as I have before obſerved) be the net content or net meaſure of the ſaid materials for the ſaid yards, which, when deducted from the quantity of timber, plank, &c. that has been charged thereto (adding in, the timber, &c. that may have been found deficient on a ſurvey taken for that year) will make manifeſt and clear the due proportion between the timber, plank, &c that ſhall have been actually applied, and that which has been miſapplied; and if the difference did not amount to two-thirds, I am very much miſtaken. Perhaps to this an objection may be made, as to its being altogether impracticable. Let the experiment be then tried on a firſt, ſecond, or third rate, &c. beginning from the time her keel is laid, to the time when ſhe is finiſhed; and if this does not prove a confirmation of what I have before advanced, that no more than one-third part of the oaken materials that are iſſued for that ſervice are actually applied in the ſhip, ---I do not know what will.

Candidus. Admitting that ſuch experiments were to be made, and the reſult of them had demonſtrated all this, yet ſtill we ſhould have been at a loſs to have known one thing more, that is, what part of the ſaid two-thirds, miſapplied, might in all reaſon have become uſeful.

Publicus. This, if you remember, Sir, has been anſwered in part already; however, as I cannot make you underſtand it better than by putting of it into numbers, let us then ſuppoſe there is eighteen thouſand load of the oak materials expended annually in all his Majeſty's Dock-yards: Now the one-third of eighteen thouſand, you know, Sir, is ſix thouſand, being that part only out of the whole which is believed at preſent to come to uſe;---the remaining two-thirds, twelve thouſand load, that which is miſapplied. Now in regard to what part of the two-thirds would become uſeful, it is paſt all doubt, that half of it muſt; there being in this proportion a great deal more allowed for fuel-wood, than what I before was of opinion: however, I had rather, much rather give up a little, than inſiſt too much.---Certain then it is, that provided the Government were to make a conſideration to the people in lieu of their privilege,---that a third part of the oaken materials expended in his Majeſty's Dock-yards, in building and rebuilding, would thereby be as it were ſnatched out of the fire, beſides a great quantity of elm and fir timber, and other of the wooden materials ſerved in by contract.

Candidus. Why, you aſtoniſh me!---Surely it wants only to be repreſented, *Publicus!* for I think, there need no other proof;---the thing ſpeaks for itſelf:---I will certainly propoſe it to ſome great man or other when I go to Town.

Publicus. Sir, had I not thought you intended ſuch a thing, I ſhould never have declared my ſentiments ſo freely.

Candidus. Nor ſhould I, *Publicus*, have taken ſuch pains to have made myſelf acquainted with them.---One queſtion or two more will be all I have now to aſk, that is, What proportion there is between the conſumption of the oak, elm, and fir timber, in ſhip building? next, to give me your opinion as to the whole number of oak-trees that are, one year with another, expended in all his Majeſty's Dock-yards: laſtly, Whether you have not diſcovered ſometimes a want of timber, when your ſurveys have been taken?---Theſe are all the queſtions I may have occaſion for, *Publicus*; therefore I beg of you to anſwer me with your uſual frankneſs.

Publicus. As to the difference of conſumption between the oak and elm timber, I am apt to believe, it may be about thirty or forty to one; and about twenty to one to the fir: of the aſh timber, &c. there is but little received: but in regard to the number of oak trees, great and ſmall, that are annually expended, it is impoſſible for me to ſay,---there may ſometimes be ſeven, ſometimes eight or nine thouſand perhaps.

As the laſt thing you deſired to be informed of, was, Whether we did not, on ſome occaſions, find the timber to be miſſing?---I ſhall let you know, Sir, ſo much as this: That if we did not ſometimes make an overcharge in the monthly account we give in of our expences of timber, &c. or charge ſome of the ſmall materials over again, it is not unlikely, in ſuch a yard as this, there might ariſe a deficiency in timber of four or five hundred loads; but as it is, when a private ſurvey is made once a year, we ſeldom find leſs than two or three hundred loads miſſing.

Candidus. This is ſome confirmation in regard to what I before ſuggeſted, from the very great number of ſmall materials that were at different times ſcattered up and down the yard: and no doubt, but whatever number of them are found miſſing, they muſt be replaced by an application to the larger materials. You muſt allow me, *Publicus*, by this time, to form ſome tolerable judgment of theſe things.

Publicus. And yet ſurely no gentleman of a right conſideration can be ſo much ſurprized at this, when he comes to be truly informed of the great neceſſities the yard's people labour under, from the ſcanty allowance that is made to maintain their families. Where a man has four or five children to provide for, there is little leſs than ſeven or eight ſhillings a week goes away only in the article of bread; and if you admit that he is ſometimes to taſte of meat, his portion of it muſt be very ſmall indeed, hardly ſufficient for the common ſupports of nature: and yet, let me tell you, Sir, the Engliſh ſhip-carpenters, *thoſe who work I mean*, do as much again in a day, very near, as either the Spaniard, Dutchman, or even the Frenchman does, who are all of them better paid. Nay, even the ſailors of our own country have at this time greater encouragement than we, who build the floating caſtles, that ſerve for a habitation for them. They pay no rent---have their board allowed them---are ſubject to no taxes, nor loſs of time, as we are; ---their payments are regular,-- ours irregular,---and oftentimes ſo diſtant from each other, as to ſubject the people to the paying an exorbitant intereſt of eighteen-pence in the pound, in conſideration of their being ſupplied with money for their ſubſiſtence. Beſides all this, the charge of a bill of ſale for every half year, nay, in ſome of the yards (I have been told), they oblige the workmen to take one out every quarter, which expence for the whole year amounts to ſixteen ſhillings for the bills of ſale only. Don't you think this is very hard upon them, Sir?---Why, Sir, if we were paid in proportion to the increaſe that has aroſe on proviſions, and every common neceſſary of life, we ſhould have at this time twenty ſhillings *per* week; for when our wages were ſettled at two ſhillings and one penny a day, *viz.* in the year 1636, or thereabouts, proviſions, &c. were then 60 *per cent.* cheaper than they now are; during all which time, although our head-officers have been advanced in *their pay* once or twice, there has, as yet, been none made to *us*, nor any conſideration whatever,---till very lately. And if theſe people can have this inſured to them---the working a little extra in the ſummer months, and the payment of their wages fixed and ſettled, they will then conſent to give up their privilege for three-pence a day, and the Government, if they pleaſe, may ſave their timber.

THIS laſt ſpeech having put an end to our converſation, I ſhall proceed in the making of one or two obſervations thereon, and ſo conclude.

As the foregoing accounts carry in them all the appearance of truth that the nature of the caſe will at preſent admit, it is not in the leaſt to be doubted, but ſome enquiry or other will, ere long, be formed on the publication of them. For, while we are made acquainted with the great hardſhips the Dock-people do labour under, we are at the ſame time let into a knowledge of the very dangerous evils that are conſequential to the want of giving them relief.

As Great Britain owns no ſuperior in the whole world for naval ſtrength, navigation and commerce, ſhe hath therefore greater reaſons to dread the want of timber, than any other Maritime Power whatever; more eſpecially as the growth of timber bears no proportion to the conſumption of it, no, not ſo much as one to ten.

The firſt ſpirit for navigation in this land diſtinguiſhed itſelf in the reign of Queen Elizabeth, *anno* 1575, and yet the whole Royal Navy then exceeded not twenty-four ſhips, ſome of which, if I am rightly informed, were under ſixty tons; and the merchantmen throughout the whole realm amounted to no more than one hundred thirty-five veſſels above one hundred tons, and ſix hundred fifty-ſix between forty and a hundred tons. In 1588, when the nation was threatened to be ſwallowed up by the *Invincible Armada* of Spain, the whole naval force, ſuch as belonged to the Queen and was hired by her, and fitted out at the expence and voluntary ſubſcription of her ſubjects, including tenders, ſtoreſhips, and veſſels of all ſizes, great and ſmall, could make no more than one hundred and forty-three. King James I. added nine ſhips of war to thoſe he found in the ſervice at his acceſſion to the Engliſh Throne; ſo that in the ſucceeding reign, our navy was conſiderably increaſed before the breaking out of the Civil Wars.

At the Reſtoration, King *Charles* II. found himſelf poſſeſſed of a conſiderable fleet, which was ſoon after greatly augmented, on account of the *Dutch* war; ſo that in 1670, the annual charge of it was reported to be 500,000l. In 1678, we find eighty-three ſhips in the Royal Navy, of which fifty-eight were of the line of battle; and at this time Sir William Petty computes, that the exports of this nation amounted to ten millions *per annum*; and the balance of our trade, by help of navigation, was fixed at the ſame time, by Dr. Davenant, at two millions. When King William III. was called in, in 1689, to ſecure our laws, religion, liberties, and property, he found 173 ſail, great and ſmall, in the Royal Navy; and it has, by the wiſe and prudent conduct of the Miniſtry, been encreaſing ever ſince, ſo as to be double what it was at the treaty of Utrecht; the Royal Navy, at the cloſe of the year 1761, amounting to 372 ſail; out of which 129 were of the line of battle. Now, as the increaſe of our merchant-ſhips ſince the reign of Queen Elizabeth has borne a proportion pretty near the matter to the increaſe of the Navy; the total of the merchant-ſhips, agreeable thereto, will at this time amount to above *ten thouſand*. To corroborate with which, I have here ſubjoined a liſt of the ſhips that were entered inward, and cleared out, from the ports of Liverpool and Briſtol, including only one arrival for the ſame veſſel in the year 1765.

LIVERPOOL.

Inward.		Outward.
738	*Britiſh* ————	795

BRISTOL.

Inward.		Outward.
384	*Britiſh* ————	319.

So that it appears, the number of merchantmen for theſe two ports only, amounts to 2236 out of the ten thouſand.---I ſhall ſtill purſue my enquiry, in order to ſhew the very great demand we now have in particular for the ſpecies of oak timber.

As we may very ſafely compute the number of coaſting-veſſels, ſuch as colliers, brigs, ketches, ſloops, hoys, &c. and the ſmall craft in the fiſhing-trade, to be quite as many as the merchant-ſhips, we muſt therefore add another ten thouſand, which, together, make up twenty thouſand of merchantmen and coaſters, of or belonging to theſe kingdoms.

In the next place, as to the number of boats, &c. which are chiefly conſtructed from the ſmaller-ſized oak timber, we are to remember, that each veſſel as above has one, ſome of them two or three. To theſe muſt likewiſe be added the lighters, barges, and wherries, employed between Graveſend and Windſor; which ſaid working-boats, as they are numbered at the Hall, do not, from a late calculation, exceed eight thouſand; yet, when it is conſidered, that the lightermen and watermen, where they occupy ever ſo many lighters and barges (ſome of them having forty or fifty), do have them marked with one and the ſame number, and that many of the watermen, where they have apprentices, do make uſe of two boats marked in like manner with one number; therefore the number of working-boats, as they ſtand at the Hall, may, on this conſideration, be very well increaſed to half as many again, which together make twelve thouſand (excluſive of many others employed in the rivers Thames and Medway, &c. &c.) Theſe, added to the foregoing number of boats, amount in the whole to between thirty and forty thouſand.

Whoever will give themſelves a moment's time to reflect on the preſent every-where-felt ſcarcity of timber, and the great increaſe of our ſhipping, they cannot but be alarmed for the conſequences, which, it is feared, muſt inevitably happen to theſe kingdoms in leſs than half a century, without making uſe of the moſt vigorous endeavours, either to increaſe our ſtore, or to be more attentive toward the better ſecuring and preſerving that part of the invaluable legacy which our forefathers have left us.

Upon the queſtion being aſked, not long ago, What proportion the timber proper for building of ſhips might bear to the quantity we were ſuppoſed to be poſſeſſed of about one hundred years ago? it was anſwered ?--To the beſt of their judgment, not above one to ſix.---So great is the decreaſe of timber in this kingdom! and at a time too when the demand for it is above four times greater than it was one hundred years ago For, even in 1678, as hath been before obſerved, the whole Navy conſiſted but of eighty-three ſail of ſhips, of which fifty-eight were of the line of battle: and when the increaſe of tonnage in our modern-built ſhips is conſidered, we may very ſafely compute, that the conſumption of the oak timber is at preſent above *five times* more than it was an hundred years ago, and above *ſixteen times* more than it was two hundred years ago, *viz.* in the reign of Queen Elizabeth. So amazingly has our navigation increaſed!

If it ſhould be aſked, Why this enquiry has been confined to the ſpecies of oak-timber in particular? we anſwer, Becauſe it is *totis* *tribus Materialiæ Rex*:---claiming the priority of regard in this nation for its many tranſcendent uſes, but above all for ſhip-building, which indeed are the walls and chief fortifications of this kingdom; *maximum firmiſſimumque hujus gentis propugnaculum*, the [illegible] glorious and moſt impregnable bulwark of this nation; *omnium noſtrorum munimen ac præſidium*, the ſtrength and defence of all our enjoyments; for the greater ſecurity and preſervation of which were the foregoing enquiries made: and ſhould the Author of this Eſſay find himſelf ſo happy as to become any way inſtrumental in theſe his earneſt, but poor, endeavours to ſerve the public, it will be a high recompence to him for the pains he hath taken. For, had he indeed concealed his knowledge of theſe things, while he believed the publiſhing of them would tend to do good, he could not have acquitted himſelf by acting the part of ſo inglorious a neuter in the common cauſe.

The ſaving of the wooden materials, it is believed, will not be the only good conſequence of the regulation herein ſuggeſted; many other materials will be ſaved too: for when a cuſtom, one of the moſt pernicious that was ever ſuffered to exiſt in a maritime country, and which in no foreign ſtate has its parallel, ceaſes to be,---the many evils it has produced will die along with it: there can be then no waſte of the King's time,---no miſapplication of iron, cordage, &c. &c. which the privilege not only of carrying, but likewiſe of ſending out their bundles of wood gives frequent occaſion for:---all theſe evils will be then prevented, by removing the temptation that allures the committing of them. And if, on a ſurvey taken of the timber, plank, or any other of the wooden-materials that are ſerved in by contract, any deficiencies ſhould hereafter ariſe,---every one muſt judge at whoſe door they ought to be placed.

On the moſt moderate computation that can be admitted, it ſeems very probable, that it muſt have coſt the Government within theſe fifty years laſt paſt, between *two and three millions of money* to ſupply the artificers of the ſeveral dock-yards with fuel-wood, when the having allowed them *three-pence* a day, which would not have amounted to *one quarter part* of that expence, might in all likelihood not only have ſaved double the amount of ſuch additional wages, but at the ſame time a quantity of timber that would, in proportion, have been ſufficient to have built fifty men of war of the line.---*Nemo in hoc negotio parum verſatus, quæ diximus, in dubium vocet; qui enim in eo ſunt occupati omnia vera eſſe ſciunt.*

Therefore, it is not to be doubted but when a knowledge of theſe things are made public, the Legiſlature will take it into their moſt ſerious conſideration to put a ſtop to ſuch a procedure, there being no fear but that---*Omnes probi honeſtique operam navabunt, ut univerſæ Reipublicæ, ſingulisque civibus conſulatur*,---all honeſt well-meaning men, lovers of order, will co-operate in whatever tends to promote the good of the Public---the eaſe and happineſs of its individuals.

THE END.

[illegible]

THE
IMPROVEMENT
OF
NAVIGATION,

BY TWO NEW-INVENTED ENGINES:
THE ONE CALLED
A *NAVIVIUM*,
FOR MEASURING A SHIP's WAY, AND KNOWING
HER PROGRESS BY INSPECTION;

THE OTHER
A *NAVIGER*,
FOR THE STEADIER STEERING, AND SPEEDIER STAYING
AND TACKING A SHIP WHEN PURSUED, OR IN
DANGER FROM A LEE SHORE.

By JOSEPH GILMORE,
MATHEMATICIAN.

FIRST PRINTED IN 1722.

[illegible]

THE

IMPROVEMENT

OF

NAVIGATION.

NAVIGATION is preferable to all other arts and ſciences, and is the glory, ſtrength, and wealth of Britain, and a bridge that joins it to the reſt of the world.

On this occaſion I ſhall conſider navigation as conſiſting of two parts, viz. coaſting, and navigation proper.

The coaſting part of navigation requires the uſe of no inſtruments but the compaſs and ſounding-lead, and is performed by practice and experience in knowing the head-lands, bays, roads, rivers, havens, creeks, ſands, ſhoals, depths of water, courſe of the tides, and the places of good anchorage; for this part, the machine is of little uſe.

But for the exerciſe of navigation proper (of which I am going to treat) where the ocean is to be croſſed from one part of the world to another, the maſter ought to be well grounded in arithmetic, geometry, trigonometry, and part of aſtronomy, to qualify and render him fit to undertake ſo great a charge as the lives of men and eſtates of thoſe who employ him. To ſuch, this machine which I call a *Navivium* will be more uſeful than any thing that has hitherto been attempted, for it ſhews the ſhip's true diſtance run on any courſe, without the leaſt trouble to the mariner, by inſpection only, without the uſe of the log-line.

There have already been ſeveral engines and methods invented to find a ſhip's run at ſea, beſides the log-line; I ſhall only mention ſome of them, which at firſt view appear much more imperfect for the end propoſed than the log-line itſelf, being founded upon no principles of art or reaſon.

The Dutch loſe more ſhips than any one part of the world, by truſting ſo much to their conjectural reckonings. Their method is to ſet two marks on the ſide of the ſhip at a certain diſtance; then by a chip thrown on the water at the foremoſt mark, they count how many pulſes of their wriſt beat till the hindmoſt mark comes oppoſite to the chip, and by that compute ſo many miles an hour.

Another contrivance was, by two large wheels upon one axis laid athwart the ſhip; but the waves ſometimes running high and irregular, and the ſhip ſometimes heeling, raiſed one wheel almoſt out of the water, and at the ſame time buried the other in it; which circumſtance ruined that projection.

Another way was tried by an engine towed after the ſhip, that by the reſiſtance of the water turned a movement with an index to ſhew the diſtance; but this machine was ſo perplexed with the ſhip's eddies, that it alſo proved leſs uſeful than the log-line.

I ſhall in ſhort give you an account what the log-line is, how it is made, and on what principles founded.

The famous Mr. Norwood, by an exact quadrant of a large radius, made an obſervation at London and York, and took the diſtance by a chain, in the nature of a ſhip's traverſe at ſea, and found it to be 69 miles 4 furlongs and 14 poles to a degree of latitude; therefore the ſame muſt be a degree of longitude on the equator, and 6120 Engliſh feet to a mile, or the $\frac{1}{60}$ part of a degree, then the half minute-glaſs muſt be $\frac{1}{120}$ part of a degree; now if you divide the ſaid 6120 by 120, the quotient is 51 feet between knot and knot, on the log-line. And yet, notwithſtanding Mr. Norwood's experiment, moſt maſters of ſhips knit but 42 feet between knot and knot, neareſt to the old computed diſtance of 5000 feet to the Engliſh mile; but a real ſtatute mile is 5280 feet, but the odd 280 are left out, becauſe the reckoning ſhould run before the ſhip. But ſuppoſe the log-line was knit at its true diſtance in proportion to the diviſions of the equator, and a man as exact as poſſible in heaving out the log, and veering out the line; yet notwithſtanding all his care, it muſt loſe or gain ſome diſtance by the winds, and the eddies of the ſhip's way. Yet again were this ſo, that the log-line would ſhew the true diſtance at the time the log was hove (which is but the ſpace of half a minute), conſidering that they heave but every two hours, or every hour at moſt, even in this ſpace of time there often happens ſeveral ſorts of winds, as hard gales, and then again calmer, which will puzzle the beſt and moſt experienced maſter to judge a mean between theſe two extremes, therefore he cannot be ſure of one mile's true diſtance. Theſe and other great errors conſidered, made me bend my thoughts to make a wheel, proportioned to Mr. Norwood's experiment of 6000 feet to the mile. The teeth and pinions that proportion it to the globe are formed accordingly.

This wheel is to be fixed under the bottom of the keel of the ſhip, where it muſt of neceſſity move no faſter nor ſlower than the motion of the ſhip ſhall direct; and ſhips being from 10 to 24 foot under the ſuperficies of the water, cannot be annoyed like the log, or any other machine, by the winds or eddies made by the ſhip's way. Beſides, if we conſider that the pivot of the water-wheel is but ^{1} of an inch diameter, and the pinion at the center of the wheel but one inch diameter, and the water-wheel 19-09 inches diameter, one ounce on the extreme parts will completely force it round, and at the hand that ſhews the diſtance, one thouſand weight will not ſtop the motion when the ſhip is under ſail; the current of water made by the contrary direction of the ſhip is ſo forcible, and the reſiſtance of half an ounce ſo very ſmall, the power being encreaſed to ſuch a degree, that it is impoſſible but the leaſt motion of the ſhip muſt ſhew the true diſtance by the hand of the *Navivium*, whoſe movement and plate that ſhew it, ſtand up in the maſter's cabin like an eight-day clock, where the maſter by inſpection on every tack, may take the ſhip's run to the one-hundredth part of a mile, without being incumbered with the half-minute-glaſs, or log-line, and that to the greateſt exactneſs imaginable.

And if at any time weeds, or any thing elſe, ſhould happen to fall foul of the firſt mover, the water wheel, in leſs than one minute's time the machine may be taken up, cleaned, and put down again; and in caſe of the ſhip's lying a-ſhore, or when the journal is out, or very nigh ended, it may immediately be drawn up and ſecured from all accidents whatſoever.

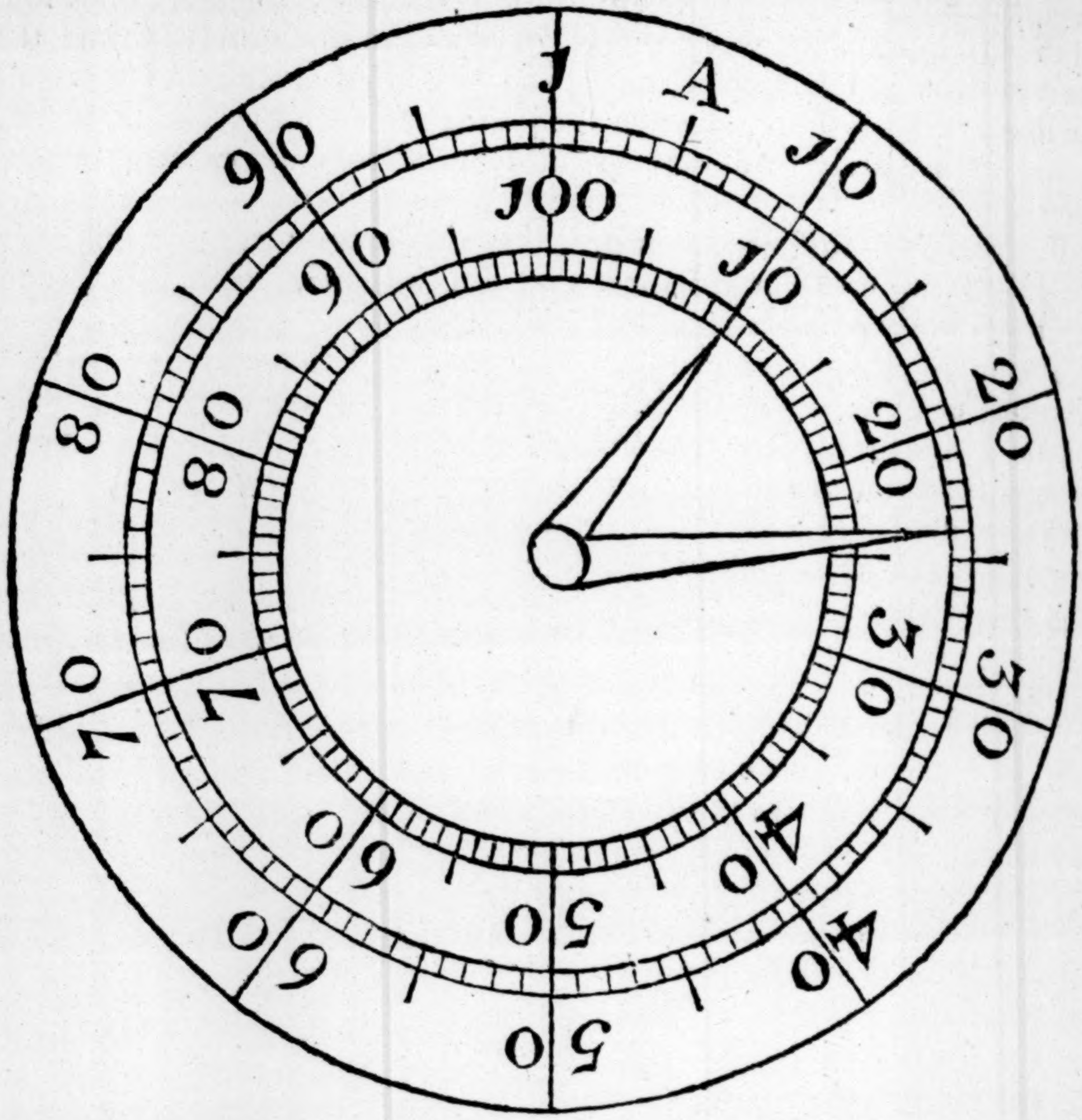
I hope this is ſufficient to prove, that this new-invented machine is the only thing ever yet propoſed, that can inſtantly, conſtantly, and exactly diſcover a ſhip's run.

The main thing that can be objected againſt this machine is, that one muſt be at ſome trouble in allowing for lee-way, as before; were this ſo, I am ſure it is better to have $\frac{9}{10}$ of the true diſtance of your voyage, than not one mile to be depended on during the whole.

I know moſt able maſters will give a very near gueſs, what lee-way a ſhip will make upon ſuch and ſuch winds, according to the mould of the ſhip, and what water ſhe draws. But theſe things will never be perfectly rectified till longitude is found out; yet in the mean time I have ſome ground to believe a great part of the difficulties we are under for want of it, will be remedied by the experience and practice of a few voyages made with the aſſiſtance of this machine. To all which I ſhall only juſt add, that by the force of another new-invented engine, hereafter mentioned, there will not be ſo much lee-way made.

Another objection may be, that in a *hollow grown ſea* it muſt of neceſſity be diſturbed, and its motion put into diſorder. To which I anſwer, That the thing in itſelf is impoſſible, becauſe a ſhip at ſea preſſeth out ſo much water as her own ſpecific gravity. For inſtance, if a ſhip and cargo weigh 1000 tons when in the water, ſhe does by her own ſpecific gravity preſs out 1000 tons of water. This water ſo preſſed out, by its own gravity endeavours to ſpread itſelf horizontally, and forms itſelf into a trapezium all round the ſhip, on which the ſhip during the whole voyage is ſupported. Now, I cannot ſee, if this great weight is ſupported by this trapezium of water, how it is poſſible the wheel under the keel ſhould be in the leaſt affected by any hollow grown ſea, becauſe all high ſeas are made on the ſurface of the water, but the ſhip ſtill retains the ſame body of water as before to ſupport it; and unleſs the keel was laid quite open to the air, there can be neither wave nor riffling to diſturb the *Navivium.*

And as to the heaving and ſetting of the ſhip, that cannot affect it, becauſe there is the ſame weight of water preſſing always againſt the keel of the ſhip as before, otherwiſe ſhe muſt periſh. This has been proved in a veſſel made on purpoſe, and in a very violent ſtorm, which had no ſenſible effect on the machine, although it was near the ſurface of the water.



A DESCRIPTION *of the* FRONTISPIECE *of the* NAVIVIUM, *and how to take the Diſtance run on every Courſe.*

ON the frontiſpiece or plate are two circles; the outermoſt divided into 100 parts or one mile; and the innermoſt likewiſe divided into 100 parts or miles. On this movement are two hands like that of a clock. The long hand moves round the outermoſt circle once every mile, and the ſubdiviſions are tenths, and hundredth parts of a mile. The ſhorteſt hand makes a revolution in a hundred miles; each diviſion being a mile. The hand ſtands now at ten miles, and the twenty-fourth part of the hundredth part of a mile (decimally thus, 10.24 miles). But be ſure to place your primes and ſeconds in their proper places: as for inſtance, Let the ſhort hand be at ten miles as before, and the long hand at five, in decimals it will ſtand thus 10.05 miles, for want of two figures to ſupply the place of primes and ſeconds. Without this care, you will commit great errors. For ſuppoſe you were to take off from your Gunter, or out of your table of logarithms 10.05 miles, that is, ten miles, and the fifth part of 100 parts of a mile; now if under a miſtake you take off from the ſaid Gunter or logarithms 10.5 inſtead of 10.05, you gain half a mile.

Therefore I hope every one will be cautious in this, and take care of the primes and ſeconds. But if you do not underſtand decimals perfectly well, to prevent ſuch miſtakes the only way is, if the ſeconds of the fractions be 5, or above 5, add an unit to the prime, and reject the ſecond; as ſuppoſe 9.55, ſet it down thus 9.6; but if under 5, reject the ſecond, as 9.53, ſet it down 9.5; or if the fraction be 10.09, ſet it down thus 10.1. This will ſave you a great deal of trouble, and be more certain; work by what tables you pleaſe, but eſpecially logarithms.

But this I cannot heartily approve of, but rather wiſh you would work by Mr. Norwood's table of natural ſines to every point and quarter point of the compaſs.

This table was a ſmall matter defective in ſome places, cauſed by the preſs, but now is carefully corrected, and gives you the tenths in the difference of latitude and departure a ſmall matter more than they really are, which is better than to be leſs.

0	Eaſt.	Weſt.					Weſt.	Eaſt.	8
	Quarters of Points		1	049	999	3	Quarters of Points.		
			2	098	995	2			
			3	146	989	1			
1	N. by E. S. by E.	N. by W. S. by W.		195	981		W. by S. W. by N.	E. by N. E by S.	7
	Quarters of Points.		1	243	970	3	Quarters of Points.		
			2	290	957	2			
			3	337	942	1			
2	N. N. E. S. S. E.	N. N. W. S. S. W.		383	924		W. S. W. W. N. W.	E. N. E. E. S. E.	6
	Quarters of Points.		1	428	904	3	Quarters of Points.		
			2	472	882	2			
			3	514	858	1			
3	N. E. by N. S. E. by S.	N. W. by N. S. W. by S.		556	831		S. W. by W. N. W. by W.	N. E. by E. S. E. by E.	5
	Quarters of Points.		1	596	803	3	Quarters of Points.		
			2	635	773	2			
			3	627	741	1			
4	N. E. S. E.	N. W. S. W.		707	707		S. W. N. W.	N. E. S. E.	4

The way of working is thus: Suppoſe your courſe was W. S. W. and the diſtance 30.5. now W. S. W. being ſix points of the compaſs, look in the table for 6 points, againſt it are the numbers 924, and 383, which multiplied by the diſtance, the product is the difference of latitude and departure; as thus, the numbers taken from the table as before hinted are

	383	924	
Diſtance	30.5	30.5	Diſtance
	11.6815	28.1820	Product.

Now the courſe being W. S. W. the greateſt number muſt be Weſting, and the leaſt Southing, obſerve ſo many figures as you have in the multiplicand and fractions in the multiplier, muſt be cut off in the product; as in this there are three figures in the multiplicand, and one fraction in the multiplier, therefore I muſt cut off four in the product towards the left hand, and let the prime be a fraction ſtill; then it will ſtand thus, 11.7. miles Southing, and 28.2. Weſting.

I do not deſign in this to preſcribe new rules in keeping journals, or working queſtions in plain or Mercator's ſailing, only ſuch few things as are neceſſary to be known in this machine, as to the taking of the diſtances, &c.

To new-ſet the hands on every courſe you make, would be very troubleſome, uſeleſs, and erroneous, becauſe it will take up time, and in that time the ſhip is under ſail, and the diſtance running on not accounted for. Therefore I think it will be the beſt way to have a book ready ruled with ſuch columns as are proper for the day of the month, courſe, whole diſtance taken from the *Navivium*, the difference of diſtances, which is the diſtance on each courſe; the winds, and Eaſting, Weſting, Northing, and Southing; but firſt I ſhall give you the form of the board inſtead of the log-board to hang up in the maſter's cabin.

Whole Diſtance.	Courſe.	Difference of Diſtances.	Winds.
30. 05	S. S. W.	30. 05	N.
60. 10	W. S. W.	30. 05	N. by W.
90. 04	S. W.	29. 94	N. E.
120. 66	W.	30. 62	N. E.
170. 55	N. E.	49. 89	W.
		170. 55	

Suppoſe this to be the firſt day taken from the *Navivium*, and entered on the diſtance-board in the maſter's cabin; the firſt diſtance taken from the *Navivium* is 30.05 miles, courſe S. S. W: the ſecond whole diſtance, viz. 60.10, take 30.05 from it, remains 30.05 for the W. S. W. courſe, then take 60.10 from 90.04 miles, remains 29.94, on the South Weſt courſe, then take 90.04 from 120.66, remain 30.62 for the W. courſe, then 120.66 from 170.55, remains 49.89 for the N. E. courſe. Now to prove whether you have ſubſtracted right or not, add all the diſtances for that day on each courſe together; and if the total makes the ſame as the laſt total taken from the *Navivium*, you have ſubſtracted right. The total taken from the *Navivium* is 170.55 miles, and all the diſtances added together belonging to each courſe make the ſame, viz. 170.55, which demonſtrates the diſtances to be right ſubſtracted.

Whole Diſtance from the *Navivium*.	Courſe.	Diſtance.	Winds.
205. 00	N. W.	34. 45	S. b. E.
230. 50	S. W.	25. 50	E. N. E.
250. 60	S. S. W.	20. 10	E. N. E.
270. 30	S.W.b.S.	19. 70	E. N. E.
280. 06	S. W.	9. 76	N. N. E.
300. 08	S. S. W.	20. 02	N. W.
	To-day	129. 53	
	Yeſterday	170. 55	
		300. 08	Proof

Now for the ſecond day's proof: Take 170.55. the total yeſterday from 205.00. what was taken from the *Navivium* to-day on the firſt courſe, remains 34.45 the diſtance on the North Weſt Courſe; then 205. from 230 50. remains 25.50. for the S. W. courſe, and ſo of all the reſt; then prove your table as before, by adding the totals of the diſtances of the two tables together; and if they make the ſame number of miles taken from the *Navivium* laſt, viz. 300.08. it is ſubſtracted right, otherwiſe not, as you ſee in the ſecond day's total of the diſtances; for this day is 129. 53. and the total of yeſterday is 170.55. added together make 300. 08. miles, the laſt number taken from the *Navivium*; and ſo work to the end of the voyage; or you may reject the place of hundreds if you pleaſe, and run the figures to the place of tens only; but I am ſure, were I to take my choice I ſhould ſet it down as the *Navivium* gives it, were it only to be ſatisfied how many miles the ſhip runs in a voyage outward and homeward, only to ſatisfy my curioſity, although in itſelf of no uſe. I hope I have made this plain to the meaneſt capacity.

I ſhall only add one table more, that is, how to work by natural ſines, and ſet the Eaſting, Weſting, Northing, and Southing in their proper columns. As I hinted before, there ought to be a book ruled for your whole voyage, after the manner of this; that is, the left hand ſide ruled, and the right hand ſide for every day's tranſactions during the ſaid voyage.

March 172½.

	Whole Diſtance from the *Navivium*.	Courſe.	Diſtance.	Winds.	Eaſting.	Weſting.	Northing.	Southing.
Friday the 23.	30. 05	S. S W.	30. 05	N.	—	11. 5	—	27.7
	60. 10	W.S W	30. 05	N. by W.	—	27. 7	—	11.5
	90. 04	S. W.	29. 94	N. E.	—	21. 2	—	21.2
	120. 66	W.	30 62	N. E.	—	30. 6	—	—
	170. 55	N. E.	49. 89	W.	35. 3	—	35. 3	—
		Proof	170. 55		35. 3	91. 0	35. 3	60.4
						35. 3		35.3
					Weſting	55. 7	Southing	25.1

I could wiſh every maſter would accuſtom himſelf always to work his canons either by natural or artificial ſines and tangents, and make uſe of the Gunter only as a proof of their work; for I am ſure the diviſions near the radius's on any of the lines are too cloſe for the niceſt eye to inſpect, when the diſtance is large and the courſe wide to the Eaſtward or Weſtward. I ſhall only add the way of working with theſe natural ſines in this traverſe only, and ſo conclude.

You muſt note, canons in this are the ſame as in artificial ſines and tangents, only make the radius 1000.

The Canon.

The firſt courſe in the traverſe table is S. S. W. diſtance 30.05. As the R^ds 1000 to the diſt. 30.05, ſo the ſine of the courſe 22.30 or two points to the dep. W. it will ſtand thus. R. 1000 diſt. 30.05 S. co. 2 P^ts or 22° 30′ to the departure.

383
30. 05 diſt.

Weſting 11. 50915

This is no more than a queſtion in the golden rule: the natural ſine of 2 points or 22° 30′ is 383, which multiplied by 30.05 the product is 11.50915; cutting off three figures divides by 1000, and 2 figures more for the fractions in the diſt. make 5 figures to be cut off in the product, remains 11 miles, and the next figure towards the right hand makes the tenths of a mile, ſo enter the ſaid 11.5 miles in the Weſt col. in the table. Then,

As R. 1000 to the diſt. 30 05, ſo the S. Comp^t. of the courſe 6 points, or 67.30 to the diff. of latitude,

thus, R. 1000—30.05—S. C. 6 Points,
924
30. 05 diſt.

Southing 27. 76620

which enter in the South col. in the traverſe table.

The next courſe is W. S. W. diſtance 30. 05: The beſt and ſhorteſt way to work ſuch queſtions by the natural ſines is, by taking the natural ſine of the courſe and comp^t. of the courſe, and multiply by the diſtance, and cut off the fractions, as before directed.

If the courſe be above 4 points, the greateſt number muſt be put in the Eaſt or Weſt col. If the courſe be under four points, the greateſt number muſt be put in the North or South col. This every maſter underſtands.

S. S. W. 2 Points 383 — 924 Comp. 6 Points
30. 05 — 30 05 Diſtance
11.50915 — 27.76620

W. S. W. 6 Points 924 — 383 Comp. 2 Points.
Diſtance 30 05 — 30.05 Diſtance
W. 27.76620 — S. 11.50915

S. W. 4 Points 707
Diſtance 29.94
21.16758 Weſting and Southing alike.

W. 30.62. placed in the Weſt column.

N. E. 4 Points 707
Diſtance 49.89
35.27223 Eaſting and Northing alike.

The Eaſting, Weſting, Northing, and Southing, you may ſee in the traverſe-table ſet down in their proper columns. Now to find the courſe, diſtance, difference of latitude and departure, made good in the traverſe, let me deſire you to uſe the tables of artificial ſines, tangents, and logarithms, and the Gunter as a proof. I need not give the canons, they being ſo perfectly known to every artiſt.

Thus I have finiſhed what I deſigned, and hope the uſe of this new-invented machine will be, under God, a public benefit, and ſave many thouſand lives of the moſt induſtrious and uſeful part of mankind.

A SHORT ACCOUNT OF THE USE OF A NEW-INVENTED MACHINE CALLED THE *NAVIGER*;

INTENDED FOR THE READY TACKING, STAYING, AND WEARING OF A SHIP AT SEA.

IT is a great and general misfortune, that through the ſtupidity and obſtinacy of ſome men, irregular inſtructions are given to builders; and no arguments, though backed with reaſon and art, can deter them from puſhing mere notions into practice; which is the real cauſe of ſo many ſhips ſteering ſo very wild at ſea, and that it is but very rarely that ſhips can be depended on in ſtaying or tacking, the conſequences of which often prove very fatal, as will appear from a little conſideration.

Suppoſe one of theſe ſhips, or any other ſhip, ſloop, &c. by winds ſhifting, or any other accident, ſhould be forced on a lee-ſhore; I am by this obliged to put my ſhip about, that is to ſay, ſtay or tack her. Upon trial, I find ſhe will not anſwer her helm. Now on ſuch a diſappointment, I muſt be obliged to wear her, and bring her to on the other tack. This (ſuppoſing room enough) loſeth me at leaſt half a mile of ground in any conſiderable ſea. But then, ſuppoſe, with the above diſappointment, I have not room enough to wear her for the land, as hath been the caſe of thouſands, I have then but one ſhift left, that is, coming to an anchor, and that in the very breach of the ſhore; and if the ſhip rides it out, it is well, otherwiſe nothing but death enſues: all which, in human probability, might have been prevented, had the veſſel anſwered her helm. Sad inſtances of this we have daily, which diſaſter, by this machine, may be prevented for the future.

Again: Working to windward in a tide's way, you may gain as much ground in two tides as otherwiſe in three, beſides the ſhunning many imminent dangers; as where ſhips are working in fleets, ſome ſtanding on one tack, and ſome on the other, they are often obliged to tack for each other; for every ſailor knows, that working thus in fleets, on each ſhip's ready anſwering her helm depends the ſafety of the whole. Beſides that, in caſe of an engagement, all men allow the weather-gage to be of no ſmall advantage: by this machine, I can ply to windward faſter, and conſequently force my enemy to the lee-gage.

Again: Suppoſe I am purſued by an enemy whom I would gladly ſhun; and as to ſailing the enemy hath the advantage, and comes up with me, his ſtarboard tack on board; by this machine I can bring my ſhip upon the other tack, and by that have the advantage of making uſe of my force into him fore and aft: ſo that no pirate can be able to board me, unleſs both of us were upon the ſame tack, which this machine can prevent; or at leaſt the certainty of tacking or wearing with that alacrity, gives me ſundry advantages towards an eſcape.

Firſt, It ſpends the day, that the night may favour my eſcape.

Secondly, If near land, I may gain a harbour to ſcreen me from his inſults.

Thirdly, By my command of tacking or wearing, and loſing but little ground (when all other veſſels loſe conſiderable) I get to the windward of him, more than he can poſſibly wrong me, by fore-reaching me.

Laſtly, This propoſal ſuppoſes a ſhip at all times, and in all circumſtances, in a better condition of ſteering; for by this machine, with the ſpeedy tacks and ſteady ſteerage, every man that hath made any proficiency in navigation (eſpecially practically) will allow that mariners can form a much better judgment of the truth of their reckonings in a ſhip whoſe ſteerage can be depended on, than in any of a contrary quality.

I once had ſome thoughts of giving the public a deſcription of the NAVIGER; but on further conſideration altered that intention, judging it better to give no more than a bare account of its performance; eſpecially ſince the advantages that may ariſe from it are principally intended for the ſervice of my country.

As our fleets have ever aſſerted the empire of the Ocean, and at all times protected our injured neighbours againſt unjuſt attempts of exorbitant power; ſo I hope they will ever have the bleſſing of Providence, and ſtill continue to be its inſtrument for curbing the immoderate power of other nations, and exerciſing that of our own with moderation, juſtice, and honour.

It is for the uſe and ſervice of this my country, I have employed my thoughts on this ſubject, and am deſirous to preſerve to it the ſole uſe and benefit of this machine. And it will be no ſmall joy and pleaſure to me, to ſee any endeavour of my own, or of any other more fortunate perſon, ſucceſsful in promoting the ſecurity and happineſs of my King and country, in which the peace and welfare of Europe viſibly conſiſt. And I hope this improvement in navigation will add a new ſtep to raiſe our maritime force ſtill higher, for the univerſal benefit of mankind.

If to ſecure our merchants from ſhipwrecks and pirates, to facilitate victory to our fleets, gain honour to our nation, and procure happineſs to mankind, be deſirable ends, I think they are all promoted by theſe machines; I am ſure they are heartily intended by the Author.

THE END.

Having ſelected the preceding Account, where the Inventor leaves us in the dark as to the Method, we ſhall next exhibit a MODERN INVENTION, where no ſecurity of Patent or other Myſtery is uſed; but may be viewed, and its Principles examined or explained, by applying any day as directed.

EXPLANATION

OF A

MACHINE

FOR

ASCERTAINING A SHIP'S RATE OF SAILING AT SEA.

THIS Machine is intended to keep a perpetual and regular account of the rate a ſhip ſails through the water, inſtead of the method hitherto uſed of heaving the log.

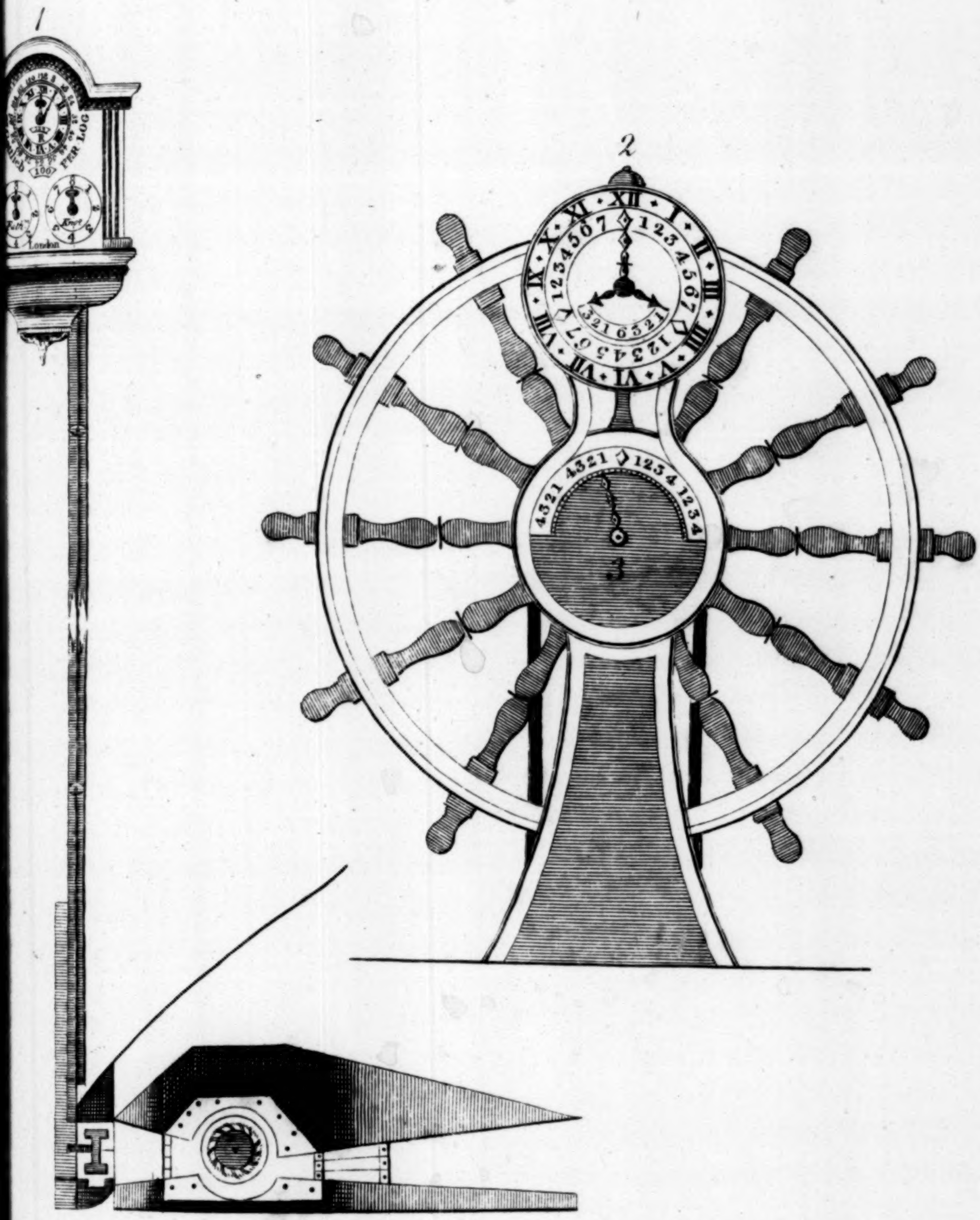
It muſt be obſerved, the log, being only made uſe of at ſtated periods, does by no means aſcertain the true diſtance the ſhip has run in any given time, as the calculation from the log does not allow for the variation in her velocity during the interval of its being heaved.

This Machine will remedy that defect, and give a continual and regular account of the diſtance run in any time, ſay during the whole voyage if required. It is formed on the principle of a *Perambulator*, and worked by the veſſel's paſſage through the water, and no difference in the velocity of the ſhip will make any error in the Machine. This Machine is fixed to the ſide of the keel, and communicates through the bottom of the veſſel by means of a long copper tube, and ſhews the ſhip's rate in fathoms, knots, miles, and degrees, on a dial-plate fixed to any convenient part on board.

Any perſon wiſhing for further information, or to try the above Machine, may have the ſame executed by the Inventor VALENTINE GOLLUB, No. 107, *Houndſditch*.

The CARTERET and WESTMORELAND PACKETS are both furniſhed with the above Machine.

EUROPEAN MAGAZINE



V. Gottlieb. Inventor.

1 A Perpetual Log.

2 A Ships. Time Regulator.

3. A Ships. Tell Tale.

Published by J. Sewell, Cornhill, Decr. 1. 1791.

BRITISH MUSEUM

OBSERVATIONS
ON THE
PROPAGATION AND MANAGEMENT
OF
OAK TREES IN GENERAL;
BUT MORE IMMEDIATELY APPLYING TO
HIS MAJESTY'S NEW FOREST IN HAMPSHIRE,
WITH A
VIEW OF MAKING THAT EXTENSIVE TRACT OF LAND MORE PRODUCTIVE OF TIMBER FOR THE USE OF THE NAVY;
IN A
LETTER
ADDRESSED TO THE RIGHT HONOURABLE
JOHN EARL OF CHATHAM,
FIRST LORD COMMISSIONER OF THE ADMIRALTY.

By T. NICHOLS,
PURVEYOR OF THE NAVY FOR PORTSMOUTH DOCK YARD.

[PRINTED IN 1791.]

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OBSERVATIONS

ON THE

PROPAGATION AND MANAGEMENT

OF

OAK TIMBER.

My Lord, *Redbridge, March* 1, 1791.

I BEG to lay before you ſome account of what in my opinion may be neceſſary to be done in the *New-Foreſt*, in order to make it more productive of timber for the uſe of the navy, as there has certainly been a great decreaſe of large timber in the kingdom within theſe few years, owing to the vaſt quantities uſed in the king's and private yards, and that care not having been taken to keep up a ſucceſſion either on private eſtates or the king's foreſts as the increaſed demand and magnitude of the object required. This, my Lord, you may be aſſured is no chimera, but an alarming fact, of which I am convinced, from a knowledge of the timber ſtate of the country in general. Still it may not be too late, with becoming perſeverance and exertion, to recover what has been ſo much neglected, at leaſt ſo as to prevent any material ill effects ariſing from it:—this very ſerious and national concern, therefore, I moſt humbly recommend to your Lordſhip's conſideration.

As this great tract of land is ſo conveniently ſituated for conveying timber to the dock-yard at Portſmouth, and the whole expence of both land and water carriage being little more than fifteen ſhillings *per* load, and when it is known to produce timber of the beſt forms and ſizes for ſhip-building, of as good a quality as timber in general, from which alſo ariſes a great number of *fine knees*, which are ſcarce and difficult to obtain at any price, there can be no doubt but every means ſhould be purſued to make it what it ought to be, and what it is capable of being made, one of the firſt nurſeries for timber perhaps in the world. And if that mode ſhould be adopted which is neceſſary, and ſhould its cultivation and management be according to the ideas I ſhall advance, I believe it may be made to produce a quantity of timber ſufficient to ſupply the whole demand for Portſmouth yard. If, for example, only twenty thouſand acres out of the whole ſpace of land, which contains about ſixty-four thouſand, were well laid down in wood, and after a certain time one tree from four acres was annually cut, and one tree with another to contain eighty feet, the yearly amount would be no leſs than eight thouſand loads of timber (and worth more than thirty thouſand pounds), which is the full quantity uſed in Portſmouth yard: at preſent there are only one thouſand loads of oak and two hundred of beech ſupplied from the foreſt for naval uſes; which is as much as it is capable of maintaining, and that not for a long continuance, unleſs there is more care and attention paid to its preſervation than there has been of late years. I am well aware how calculations of this kind are liable to error, and likewiſe how much the ſucceſs of every great undertaking depends upon the activity, diligence and judgment of the people entruſted with the execution of it—yet, from mature conſideration, I am perſuaded that this extenſive foreſt may, with ſome tolerable management, be brought to produce the quantity of timber I have mentioned, without giving offence to the claimants or encroaching on their rights; the particular means of effectuating which I ſhall now endeavour to point out.

Firſt,—The flat and ſwampy lands, where there are woods or plantations, ſhould be immediately drained, as nothing contributes more to the health and growth of oak trees than keeping the land dry, by having drains properly made ſo as to prevent the roots of the trees being chilled or ſoaked in water; for whenever this happens, the roots, which are the conductors of nutriment, become overcharged with watery particles, whereby the aſſimilating powers are deſtroyed and vegetation is checked; the conſequence of which is, the trees ſoon die. This is to be ſeen in many parts of the foreſt, particularly in the low places in *Irons-Hill*, *Caſtle-Malwood*, *Aſhhurſt* and *Denny Walks*, where there is a vaſt number of trees dead, or dying, of a ſmall ſize, which would have grown to large dimenſions had this neceſſary work been accompliſhed in due time; the ſoil being remarkably good, and the dry and healthy parts producing ſome of the largeſt and beſt timber of any in the foreſt, and, taking one with another, the diſtance of theſe walks is not more than five miles from the ſhipping place. It is to be obſerved, that on all riſing and hilly lands, where the ſoil is kind to the growth of timber, and the trees, are kept at a proper diſtance from each other, they will be ſeen healthy and flouriſhing, of which no place affords a better example than the *Foreſt* of *Dean*. Whenever plantations are intended to be made, or woods raiſed, this neceſſary buſineſs of draining ſhould be one of the firſt things to be conſidered and attended to, for on this the ſucceſs of the undertaking muſt in a great meaſure depend.

As nothing aſſiſts more in the preſervation and propagation of timber trees than thorns and buſhes of all kinds, eſpecially where there are no fences to keep off the cattle; there can be no better guard or fence; and whenever underwood is ſuffered to ſtand in open places, it never fails to bring a ſtock of timber, provided the ſoil is friendly to the growth of it. This muſt be evident to every one who has taken the leaſt notice of wood-lands, or how trees are propagated, and it muſt be equally ſo, that by whatever means the buſhes or underwood are deſtroyed, where the lands are not incloſed, it will moſt aſſuredly prevent a ſucceſſion and increaſe of timber; as by which the young timber plants are deprived of their protectors and nurſes, or deſtroyed with them, and by this means alſo thoſe plants which come up from the acorns or ſeeds tha

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are dropped by the birds, or other caſual means, are left open and expoſed to various enemies and are ſoon deſtroyed, which otherwiſe would be a great ſource of propagation. From theſe obſervations confirmed by experience, it is certain that the conſtant cutting of the thorns and underwood of all ſorts in the foreſt by the keepers, under the pretence of browſe for the deer (by the ſale of which ſome of them are known to gain very conſiderable annual emoluments) muſt be attended with the moſt miſchievous conſequences to the growth of the timber. Therefore if the deer were removed (as recommended by the commiſſioners of the land revenue) it would not only put a final ſtop to this very deſtructive practice, but the fences of the incloſures would be kept up at a much leſs expence than at preſent, as well as others made at a cheaper rate; it not requiring ſo high or expenſive a fence to keep out cattle as deer; nor indeed would it be neceſſary to have ſo many incloſures, as the trees would be propagated naturally by the aſſiſtance of the buſhes. The keepers alſo, inſtead of being employed in looking after the deer for the accommodation of a few individuals at the public expence (which operates in the deſtruction of the timber), might be much better engaged in taking care of the woods, which would be productive of real benefit to the country: I mean not by this to caſt the leaſt odium on this ſet of men; on the contrary I think them very active and diligent, and that they would be extremely uſeful were their attention directed to proper objects.

If the mowing of fern is allowed (though it is prohibited by the foreſt laws) it ſhould be confined to ſuch particular parts of the foreſt as where it could do no damage, and where the officers ſhould point out; the preſent mode of doing it being extremely injurious, as the plants of all kinds are cut off almoſt as ſoon as they come up, and of courſe the woods are prevented extending themſelves, and the detached and intermediate parts thereof from uniting, which they would do, was this indiſcriminat edeſtructive practice diſcontinued. Mr. MORTIMER, in his Huſbandry, ſays, that "trees planted where fern grows are obſerved to thrive very much, even though it be upon a hot gravel; the reaſon of this is, that the fern ſhades the roots and keeps them moiſt and cool."

Much to the ſhame and diſgrace of thoſe who have had the management of the foreſt, either from neglect, connivance, or deſign, they have ſuffered many parts of it, and ſome of the incloſures, to be entirely overrun with rabbits, to ſuch a degree, that there is not the leaſt veſtige of timber or plantation to be ſeen, only the fences, and thoſe in extreme bad condition, particularly *Wilverly Incloſure* of about five hundred acres of good land, and well ſituated for the growth of timber, and which have been known to produce trees of very large ſizes; but it is impoſſible there can ever be any more come forward ſo long as theſe deſtructive vermin are ſuffered to remain, and their propagation is encouraged by the keepers in the manner it is. It will be to very little purpoſe, therefore, either to freſh plant or repair the old incloſures, or make others, in the parts ſo infeſted. Several faint attempts have been made to deſtroy theſe animals, but I believe they are now more numerous than ever; and ſo long as it is the intereſt of the keepers to encourage their increaſe, and they the only people employed to deſtroy them, it is not likely that this great evil will very ſoon be removed. Hence it muſt appear how eſſentially neceſſary it is that ſome determined and vigorous means ſhould be immediately adopted for their extirpation, not ſubject to be fruſtrated by the art or connivance of any intereſted people.

One of the moſt eſſential things to be obſerved in the management of oak woods, if the plants have been raiſed pretty cloſe together, as they always ſhould be, as they thereby ſupport each other, and are ſheltered from the inclemency of the ſeaſons for the firſt twelve or fifteen years, is, the judicious thinning of them from time to time, until the trees are reduced to a proper number, and ſtand at a diſtance to grow to maturity; this muſt depend on the judgment of thoſe people who have the management of them; firſt conſidering the nature of the ſoil, and the uſes to which the trees are to be appropriated. Was this work properly done, I believe it would be found (after drawing much uſeful timber), that upon land of a middling quality there would be forty or fifty trees growing upon an acre, and arrive at a ſize in about a hundred or a hundred and twenty or thirty years, ſufficiently large for naval purpoſes of a ſuperior kind, and worth at leaſt ſix pounds a tree one with another. By this reckoning they would ſtand at about thirty feet apart, which ſpace I think quite enough to admit of their coming to full growth and expanſion, if the ſoil runs deep; in confirmation of this idea, there are to be ſeen in many parts of the foreſt from forty to fifty fine oaks ſtanding on an acre, and will meaſure one with another two loads a tree. I have been more particular on this head, as it has been ſaid by ſome that nine or ten trees are ſufficient to grow upon an acre of land. When oak trees ſtand at a great diſtance from each other on a deep ſoil, they have generally large heads, and contain a great quantity of timber, including the limbs or branches of each taken collectively with the body; the trunks are commonly large and ſhort, conſequently not ſo valuable for ſhip-building as if they were longer, which they would be if they were ſuffered to grow nearer together, in which caſe part of the timber that would be expended in the tops would be drawn into the bodies, and of courſe a greater quantity of uſeful timber produced in a tree, and more trees on the ſame quantity of land. I judge that oak trees thus raiſed would by the time beforementioned contain, one with another, about ninety or a hundred feet, which is larger than the average meeting of timber received at the king's yards, and ſufficiently large to keep up the navy upon its preſent eſtabliſhment.

Several of the woods in the foreſt are almoſt ruined for want of this neceſſary work of thinning them, and its being done at proper times; particularly the incloſures which were made in the year 1700;—theſe were originally well planted, and great quantities of trees brought up in them, which now remain ſo cloſe together that they are nearly ſtagnated, particularly in *Saliſbury Trench*, *Brimley Coppice*, and *Woodſidley*; and although it is ninety years ſince they were planted, the trees will not meaſure one with another above ſix or ſeven feet a tree, whereas, if this buſineſs of thinning had been done as it ought, the remaining trees would by this time have been of a ſize nearly fit for naval uſes, as in ſome of the woods that were planted at the ſame time, the trees which have had room to expand, and a free air admitted to them, will meaſure from ſeventy to eighty feet. But notwithſtanding this great neglect and inattention, I think theſe woods may, by immediate care and exertion in thinning them, be brought about and made of great value and benefit to the country; care, however, muſt be taken not to cut too many trees in a wood in one ſeaſon, as by ſo doing ſuch as remained ſtanding would of a ſudden become too much expoſed to the weather, and thereby be liable to be chilled and ſtunted; which frequently happens by the injudicious manner of thinning woods. I think it would be of much ſervice to the foreſt in general, if the ſuperintending officers had diſcretionary power and orders conſtantly to ſelect and mark for felling all ſuch ſmall oak trees as were unthrifty, or impeded the growth of others which were flouriſhing, or ſuch as appeared likely to become fit for naval uſes, and indeed wherever they ſhould ſee it neceſſary to give room, or think it beneficial: in doing of which all the trees ſhould be marked with progreſſive numbers on their ſides with black paint, their eſtimated contents taken and places where ſtanding, together with their value, with a reſerve of, and a different mark put on, all ſuch as may be found fit to be converted into tree-nails, or any other naval uſes, though neceſſary to be felled before they arrive at their full growth and maturity. There ſhould be likewiſe a regular report of the whole made annually to the treaſurer, nor ſhould any be felled until an order from thence; the ſame ſhould then be ſold by auction, or otherwiſe properly accounted for. This buſineſs only, if well conducted, would be the means of making the foreſt much more productive of timber for the navy than it is at preſent.

The claimants being ſuffered to go into the woods to fell the trees that are aſſigned for their fuel wood, I apprehend, is attended with conſequences extremely detrimental to the foreſt. Although care is taken to ſelect and mark for this purpoſe, nothing but ſcrubbed or defective beech trees, or ſuch as impede or obſtruct the growth of the oak; and the ſeveral allotments are made as near as poſſible according to the ſeveral claims, by the purveyor and deputy woodward, in the preſence of ſome of the regarders, and accounts given to the keepers of the aſſignments, with directions to ſee that no other trees are felled but thoſe of which they have an account; yet as moſt of the trees are ſold and applied to other uſes than that of fuel, as trucks, rails, bedſteads, boards, and many other articles, and ſaw-pits dug in the moſt convenient places of the foreſt and among the woods for the purpoſe of manufacturing of them, notwithſtanding the act of the 10th of King William the Third, made for the increaſe and preſervation of timber in the *New Foreſt*, which declares that no one ſhall ſell or otherwiſe diſpoſe of their fuel wood; it is evident from this repreſentation, that there are great openings for fraud, and ſtrong inducements to take ſuch trees as will beſt ſuit the purpoſe of the dealers, and ſuch as have not been aſſigned, particularly as the means of detection are not very eaſy. As well as there is every reaſon to believe that there are great abuſes committed by this mode of cutting the fuel trees, it muſt be obſerved beſides, that there is much damage done to the woods by the careleſs manner in which they are felled, and, I fear, too often with a deſign of doing damage. To remedy this evil (as I have before propoſed in a letter to Sir Charles Middleton), the trees allotted for thoſe who have juſt claims for fuel wood ſhould be felled, cleaved, and corded under the direction of the foreſt officers, and delivered to the claimants in their ſeveral proportions according to their allowed claims; this would not only prevent many depredations being committed, but moſt likely greatly leſſen the quantity of fuel trees that are aſſigned annually, which is between three and four thouſand, and the number of loads being eight hundred and forty-ſix, and the number of claimants for fuel two hundred and fifty.

The encroachments made on the foreſt within theſe few years have not been many, nor of much conſequence; and I judge, if the verderors were to hold their courts regularly, and puniſh the treſpaſſers by fine, as they have done lately, and the officers and keepers were active in throwing out the land when illegally taken in, it would ſoon put a ſtop to this practice altogether; as I believe the boundaries of the foreſt are ſufficiently aſcertained and known by the ſurvey and plan taken under the directions of the commiſſioners of the land revenue, to prevent any diſputes ariſing on this head. The worſt effects that have ariſen from encroachments on the foreſt, I take to have been the cottages, whoſe inhabitants are continually committing depredations on the woods, by lopping, cropping, and ſtealing the trees, which is the caſe in the neighbourhood of all the villages in and about the foreſt where there are woods; and the damage done near *Cadenham* and *Lyndhurſt* is very great and ſhameful, and I have no doubt but theſe depredations may be prevented with proper exertion.

As all the different ways known of making plantations and raiſing woods of all kinds of foreſt trees are fully and minutely deſcribed by Dr. HUNTER, in his edition of EVELYN's SILVA. I ſhall preſume only to make a few obſervations on this head, and ſuggeſt what I judge neceſſary to be done in the foreſt, in order to extend the woodlands by making incloſures for that purpoſe.

The foreſt conſiſting of a great variety of ſoils, the firſt object, in my opinion, ſhould be the proper choice of ſpots and ſituations, ſuch as where the ſoil is moſt congenial to the growth of trees, regard being had to its vicinity to the ſhipping places for timber. On theſe ſpots, incloſures ſhould be made of ſuch ſizes as the nature of their ſoil and ſituation may point out, fenced in with a wide and deep ditch, with poſts and rails ſecurely placed in the banks ſo as effectually to keep out deer and cattle—many good patterns of theſe are to be ſeen in this neighbourhood on private eſtates,—gates and bridle ways ſhould be made in ſeveral parts of the fences where thought neceſſary, and wide openings or roads ſet out and left acroſs and athwart the ſpots intended to be incloſed, not only for admitting carriages and ſporting gentlemen to paſs, but to admit freſh air to act on the woods, which will very much contribute to their health and proſperity; this is what ſhould be always attended to in making plantations. The land ſhould be drained if required, and at all events trenches ſhould be cut and outlets made to carry off the water, in order to keep the land dry and healthy. After this work is well done, the ground will want little other preparation, only that of digging ſmall beds at about a yard apart and putting an acorn in each (one I think quite ſufficient), placed about two inches deep in the earth, which when completed, the different kinds of underwood ſeeds ſhould be diſtributed over the whole (particularly of the white and black thorns), as the plants of every ſort ſhould be brought up thick together, as by this mode of planting they will protect each other from the inclemency of the weather; and if the plantations ſhould be in bleak ſituations, they may be ſheltered by ſcreens of firs; and if after twelve or fifteen years the plants come up well and ſtrong, the thinning ſhould commence and be continued from time to time, as has been before obſerved. But in order to enſure the ſucceſsful growth of the plantations, I would recommend that three or four ſmall nurſeries of about two acres each ſhould be made in different parts of the foreſt for raiſing oak plants, in order to be removed into the incloſures to ſupply any deficiencies that may happen from the planted acorns not taking effect. In planting the incloſures particular attention ſhould be obſerved in the choice of the acorns, which ſhould be taken from the moſt healthy and flouriſhing trees of the true Engliſh oak, ſuch as are ſtanding about *Rinefield Lodge*; finer trees, or better timber for ſhip-building, than which they are, I believe, are not to be found in the kingdom. I mention the true Engliſh oak becauſe there are two different ſorts of oak growing in the foreſt, one the true Engliſh, the wood of which for firmneſs, ſtrength, and durability, is preferable to any other for ſhip-building, and is well known all over the world; the other is called by the woodmen in the foreſt the dur maſt oak, which I believe to be the ſecond ſort of oak deſcribed by Mr. MILLER in his GARDENER'S DICTIONARY, the wood of which is not ſo ſtrong, hard, or durable, as of the Engliſh. For want of this caution, or perhaps the difference was not then known, ſome of the incloſures that were made in the foreſt in 1700 were planted with acorns taken from the dur maſt oak. I take notice of this circumſtance that in future this error may be avoided in making plantations. I recommend this method of making plantations, without any previous preparation of the land, as being the cheapeſt, and is found to anſwer extremely well; thoſe that were made in the foreſt in 1700 were all done ſo, and the plants come up in them thick and well, and ſome of the woods are now very fine and flouriſhing.

Timber trees of all kinds intended for uſe or profit, ſhould be felled as ſoon as they arrive at their full growth and maturity. This will be at different periods from the time of their being planted, according to the depth and goodneſs of the ſoil they ſtand in, and the nature of the timber; after this period they will gradually decay, and generally in proportion to the times of their arriving at perfection, which indeed is the fate of all animal and vegetable life.

As oak is the only timber of any conſequence made uſe of in building ſhips for the navy (or I believe ever will be with good effect), and as, from my ſituation, I am acquainted with the great difficulty of obtaining timber of the different forms and ſizes for that purpoſe, as well as the quantity that is neceſſary to ſupport and keep up the navy upon its preſent formidable eſtabliſhment; my preſent obſervations are particularly directed to the cultivation of oak trees, and therefore cannot help expreſſing a wiſh that gentlemen would pay more attention to this very important ſubject, as I am convinced that their attention would be repaid with double advantage and ſecurity.

From every information I have been able to collect, I judge that the times at which oak trees arrive at maturity from their firſt planting, are from one hundred to one hundred and forty years; this however depending upon a variety of fortuitous cauſes, I believe there can be no predetermined time fixed. The only certain criterion by which a good judge never can be deceived, is the appearance of the trees themſelves, the period of their maturity and decay being as clearly and ſtrongly indicated by their appearance, as when any fruit or grain is ripe; and for the good of the foreſt it ſhould be an invariable rule in felling the trees for the navy, to ſelect ſuch only as are paſt improving, which practice I have ſteadily purſued ſince this buſineſs has been under my management; and if a regular ſucceſſion of trees is intended, whether it be on open or incloſed lands, it is a rule that ſhould never be departed from; for you cannot do woods a greater injury than by felling the growing, flouriſhing trees, and leaving the old decaying ones ſtanding; for in ſo doing you take away thoſe that would improve and pay extremely well, and leave the others to ſpoil and encumber the land, to the loſs of both the timber and its value, which I am ſorry to ſay was the practice prior to my coming to the foreſt; the conſequence of which has been, the navy for theſe laſt eight years has been ſupplied from thence with much defective timber; and a great number of trees, which, had they been felled in due time, would have been ſound and good, have been entirely thrown away on account of their defects. The following obſervations, which I lately ſubmitted to the commiſſioners of the land revenue, I take the liberty to remark now:—"After the trees in the foreſt are felled for the navy, "I raſe off their tops (which is marking the trees where the tops are "to be cut off, reſerving what is fit for the navy); theſe are valued "by the regarders preſent, and afterwards ſold by the deputy ſurveyor, and left to be cut off by the purchaſers. The caſt timber "rejected on the ſurvey is alſo valued by the regarders and left for "ſale under the charge of the deputy ſurveyor. This is the mode in "which this part of the buſineſs has hitherto been carried on; but "I beg leave to ſuggeſt, that there appears to be an impropriety in "leaving the tops to be cut off by the purchaſers, and would recommend that they ſhould be cut off at the expence of the crown, it "being almoſt impoſſible to prevent the hewers from being ſecretly "connected with the purchaſers; and I believe that advantages "have ſometimes been taken of the opportunities thereby afforded "of cutting off more than was intended to be ſold."

If the foregoing obſervations ſhould be thought juſt, and the mode I have pointed out of conſequence ſufficient to be carried into execution, and ſhould the ſix thouſand acres of land be kept conſtantly well incloſed and diligently attended to, as government has a right to do, and what in my opinion ought to be done, all the parts of the foreſt which are applicable to the growth of timber would, I conceive, be gradually brought into woodlands, and yield a regular and large ſupply of fine uſeful timber for the navy, as well as enſure a continuance of the fuel-wood and repair-timber to the claimants, who would alſo peaceably enjoy their rights of depaſturing their cattle in an extenſive manner on the open parts, without being injurious to the young trees, eſpecially if the underwood was preſerved and the growth of it encouraged in the manner I have before recommended), particularly of the white and black thorns. I lately ſurveyed a very fine parcel of timber for the navy (the purchaſe of which was upwards of eleven thouſand pounds), upon an eſtate belonging to SIR HARRY ST. JOHN near *Troyford*, that had been entirely brought up on unincloſed lands (where the tenants of the manor have a right of commonage, and on which they depaſture a great many cattle) by the protection of the white and black thorns; and there is now ſtanding on thoſe very lands a vaſt number of fine oaks in ſucceſſion, ſupported and guarded by the ſame means: and there was felled on the ſame lands, about forty years ago, the like quantity, and one thouſand four hundred pounds worth ſix years ago: and from the waſte lands of another eſtate, well known in this neighbourhood, there has been ſold more than twelve hundred pounds worth of timber a year for theſe laſt twelve or thirteen years, and there is now a great ſtock of timber remaining. Theſe are ſuch ſtriking proofs amongſt the many that may be adduced of the utility of encouraging the growth of buſhes in bringing forward crops of timber-trees upon open lands, that it is worth the attention of gentlemen who wiſh to improve the waſtes of their manors in the moſt advantageous way, and the curious and well wiſhers to their country would receive much pleaſure in ſeeing how trees are propagated ſpontaneouſly, or rather without the aſſiſtance of art.

After what the commiſſioners of the land revenue have ſo juſtly and judiciouſly repreſented and propoſed in their report to Parliament reſpecting the government of this foreſt, it is wholly unneceſſary for me to ſay any thing on this head.

The proper ſeaſon for felling oak trees, ſo as to render timber moſt durable, has been a ſubject of much ſpeculation and enquiry; and it is now a general and received opinion, that the wood of oak trees felled in the winter months with their bark on, will endure longer than that of thoſe felled in the ſpring of the year when the bark will ſtrip. But I know of no experiments that have gone to prove this in a ſatisfactory manner. Yet government, from an idea of this being the fact, has been induced to allow the timber-merchants ſeven pounds five ſhillings, in addition to the uſual prices, for every hundred pounds worth ſo felled for the uſe of the navy; allowing, however, this to be the fact, which is by no means certain, the manner in which it is uſed in the king's yards muſt totally deſtroy its utility, by being, as it is, indiſcriminately applied with timber felled in the ſpring, in the building or repairs of ſhips. If there is any benefit to be derived from winter-felled timber, it ought moſt aſſuredly to be uſed apart, and not mixed with any other in the ſame ſhip. Suppoſing ſhips were wholly built with winter-felled timber, would not the public ſuſtain greater certain injury by the additional price that muſt be given for it, and the loſs of the bark, than they would be benefited by ſuppoſing them to laſt ſomething longer.

It is well known, that oak timber of a good quality, when worked and placed ſo as the air may act freely on it, and not too much expoſed to the inclemency of the atmoſphere, whether it be felled in the winter or the ſpring, will endure time immemorial.

The quick decay of our ſhips of war has given riſe to many ſchemes and methods to prolong their duration, and government has been at conſiderable expence in putting them into execution, but experience has proved that not one of them hath hitherto anſwered the intended purpoſe: indeed, from the conſtruction of ſhips, their many parts are ſo cloſely connected, and ſo come in contact with each other, that the juices of the timber, which would otherwiſe evaporate and fly off, are in general ſo confined and ſurrounded with foul air, that they ſoon ferment and bring on putrefaction and rottenneſs: this naturally points out the neceſſity of the timber being well and properly ſeaſoned before it is uſed in ſhip-building, and as free a communication of freſh air admitted to it as poſſible, after being ſo uſed; this being the eaſieſt, and I believe would be found the moſt effectual means of prolonging the duration of our navy: and if ſhips were to be built in the dry, under ſome kind of covering (which in my opinion they might, and is what I ſuggeſted ſome years ago in a letter to Mr. HUNT, late ſurveyor of the navy, who was of the ſame opinion, and approved of the idea), it would contribute much to their preſervation. There can be little doubt of their receiving conſiderable injury during the time they are building in the preſent mode, by which they are ſo much expoſed to the weather, that the ſun and wind rend many parts of the timber and plank aſunder, into which the wet of courſe gets, as well as many other parts that are in contact, and thereby the foundation of their decay is commenced, there being no way of again making ſuch places perfectly dry.

The COUNT DE BUFFON, by his experiments on timber, has inconteſtably proved, that by ſtripping oak trees of their bark in the ſpring of the year, and letting them remain ſtanding till they die before they are felled (which will be about the third year), the wood will become more ſolid and ſtrong, and probably more durable.

From this idea I propoſed to the Navy-board, to reſerve all ſuch ſmall oak trees as ſhould be thought fit to be converted into tree-nails for the uſe of the navy, which may ariſe from the thinning of the woods in the foreſt, and to have them ſtripped of their bark ſtanding; which propoſition was acceded to; and in the ſpring of 1789 I had four hundred trees ſtripped ſtanding for this purpoſe, and thirty more in the ſpring of 1790, and propoſe felling the firſt quantity in the autumn of 1792, and ſo on at the ſame diſtance of time as the trees are ſtripped from ſpring to ſpring. Should the reſult of theſe experiments prove efficacious, it may be worth the attention of government to endeavour to make this practice as general as poſſible for all timber to be uſed in the navy.

As trees receive the principal part of their nutriment from the earth by their roots, the larger and more vigorous theſe are, the greater quantity of nouriſhment they convey to the trees, and as they decay, or fail of their aſſimilating powers, their reſpective trees or branches alſo decay and periſh ; and I have found more defective trees from the periſhing of their limbs, than from any other cauſe ; and theſe defects generally begin to appear as the trees arrive at maturity and increaſe in gradual decay. This ſhews the neceſſity of felling all trees which are intended to be uſed for timber as ſoon as they come to perfection. The limbs frequently periſh and fall off before the trees are ripe, owing to the correſponding parts of the roots giving out ; and very often I have known a vaſt number of fine trees entirely ſpoiled, owing to their limbs being lopped off by the cottagers ; for by whatever means the limbs are ſeparated from the trees while ſtanding, it ſeldom fails to produce defects, except the ſmall branches, that it periſh and fall off as they advance in growth. This evil might be remedied, if taken in time, by the application of Mr. **FORESYTH**'s compoſition, which he has diſcovered for curing the defects in trees and for reſtoring their bark ; by the uſe of which compoſition, in his Majeſty's gardens at *Kenſington* (where Mr. **FORESYTH** is gardener) very ſurpriſing effects have been produced, not only in curing defects but even in bringing forth entire new trees upon the old ſtems in a very ſhort time ; inſomuch, that it may be called a recreation, for which, in my humble opinion, it ought to be encouraged, as it promiſes to be of public utility.

Meſſieurs **BUFFON** and **DU HAMEL** have found by their experiments, that where the limbs or branches of trees have been decayed, the roots on the ſame ſides, or correſponding to them, have been in a bad ſtate (as there is certainly a connection between the branches of the heads and roots), and have alſo proved, that on the ſides of the trees where the ramifications of the roots are in the greateſt abundance and moſt vigorous, the annual ligneous coats of the trees are the thickeſt, and of courſe the moſt excentric from the hearts ; cauſed by a greater quantity of nutritive matter having been tranſmitted by the roots on thoſe ſides than the others.

Trees of all kinds increaſe in their diameters by additional coats of new wood annually formed by the ſap between the bark and the coat of the preceding year (by which the age of all trees may with certainty be obtained), and theſe coats never increaſe in thickneſs after being ſo formed, though they do not become perfect wood at their firſt formation, but are gradually matured to it by the aſſimilation of the juices, which are collected by the roots, and guided by the laws of Divine Providence ; therefore according to this theory, which is confirmed by experience, there is no expanſion from the hearts of trees, as ſome have imagined. Of this opinion Mr. **EVELYN** ſeems to have been ; but he was certainly miſtaken, and had not carried his reſearches ſufficiently far to have obtained the truth on this head, which he might have done, and been convinced of his error, by cutting out two pieces of bark of about five inches ſquare, exactly oppoſite to each other, from a young flouriſhing oak tree, and then taking the diameter of the tree upon the wood at that place, and alſo another diameter upon the bark at right angles from the former, at the ſame height, and kept the dimenſions and compared them with the tree two or three years afterwards, he then would have found that the ſize of the tree had been conſiderably increaſed at the place where the diameter had been taken on the bark by the addition of the annual coats, and remained juſt the ſame where the bark had been taken off; for wherever any part of the bark of an oak tree is taken off, the tree ceaſes to increaſe in ſize at that part, and is thereby ſure to receive conſiderable damage.

Trees increaſe alſo in height by the repetitions of new ſhoots, and theſe ſhoots never extend in length after being once formed; therefore, according to this principle, trees do not increaſe in height from their roots to the extremity of their branches, but from the extremity of their branches upwards. This, I know, is contrary to the common received opinion, which is, that every part of a tree grows gradually in height from the root upwards, but is not the fact, and of which any one may be ſatisfied by meaſuring the diſtances from the root to any limb, or the diſtance between the limbs of a growing tree, and compare them at any future time, and it will be found that theſe diſtances have not increaſed in the ſmalleſt degree, which would have been the caſe had the growth in height been gradual through all the parts of the tree.

I mean not to deſcribe the anatomy or component parts of trees, or the uſes of the ſeveral veſſels in conveying and concocting the juices, and forming them into nutritious and excrementitious parts; and indeed it would be arrogant and ridiculous for me to attempt it, after having been ſo learnedly and minutely done by Doctor HILL, Doctor HUNTER, and others. I only wiſh to aſcertain how the ſeveral parts of trees are formed from theſe wonderful combinations, and how trees may be produced and applied for the benefit of the country.

Oaks flouriſh beſt and grow the quickeſt in a rich deep loamy ſoil, and I have found by experiments and general obſervations for more than thirty years, that the wood of ſuch trees is of the firmeſt and beſt texture, and I believe it will be ſo found in all the different ſpecies of trees that grow the faſteſt; cauſed, I ſuppoſe, by their annual ligneous coats being large, and the pithy ſubſtances which are formed between each being few in proportion. The Count DE BUFFON has proved by many experiments, that where the ligneous coats are largeſt, the wood is ſtrongeſt and heavieſt.

If the obſervations I have here made ſhould in any way contribute to the cultivation and improvement of the foreſt lands with timber for the uſe of the navy, or be the means of throwing the leaſt light on the management and propagation of oak trees in general, I ſhall receive great pleaſure; but be that as it may, I ſhall enjoy much ſatisfaction in having diſcharged what I conceived to be my duty in attempting it; being convinced that it is a matter of the greateſt importance to the country, and at this time requiring particular attention. I therefore hope that your Lordſhip, and others high in office, may think it a ſubject worthy your conſideration, and pardon me for taking the liberty of laying before you theſe hints—And am, my Lord, with great reſpect,

Your Lordſhip's moſt obedient humble ſervant,

THOMAS NICHOLS.

A TABLE,

A TABLE,

Shewing the number of Trees that will ſtand upon an Acre of Land at different diſtances from each other, from ſix to thirty-five Feet; by which may be known the number of Trees ſtanding upon any given quantity of Land by taking their average diſtance.

	Feet.	Number.	
Trees to ſtand diſtant from each other.	6	1210	Will ſtand upon an Acre of Land.
Ditto	7	888	Ditto.
Ditto	8	680	Ditto.
Ditto	9	537	Ditto.
Ditto	10	435	Ditto.
Ditto	11	360	Ditto.
Ditto	12	302	Ditto.
Ditto	13	257	Ditto.
Ditto	14	222	Ditto.
Ditto	15	193	Ditto.
Ditto	16	170	Ditto.
Ditto	17	150	Ditto.
Ditto	18	134	Ditto.
Ditto	19	120	Ditto.
Ditto	20	108	Ditto.
Ditto	21	98	Ditto.
Ditto	22	90	Ditto.
Ditto	23	82	Ditto.
Ditto	24	75	Ditto.
Ditto	25	69	Ditto.
Ditto	26	64	Ditto.
Ditto	27	59	Ditto.
Ditto	28	55	Ditto.
Ditto	29	51	Ditto.
Ditto	30	48	Ditto.
Ditto	31	45	Ditto.
Ditto	32	42	Ditto.
Ditto	33	40	Ditto.
Ditto	34	37	Ditto.
Ditto	35	35	Ditto.

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APPENDIX.

NAVAL COMMUNICATIONS.

No. I.

To the EDITOR *of* PAPERS *on* NAVAL ARCHITECTURE.

SIR,

I HAVE read your little Collection on Naval Architecture with pleaſure; and though no theoretical or profeſſional man, I have annexed what occurred to me on the occaſion. If it gives hints to others, I ſhall be happy in the opportunity of drawing out the ſentiments of thoſe better informed.

The art of building of veſſels has been, in one ſhape or other, general, and common to all nations and ages. Neceſſity has been the mother of invention; and what accident has diſcovered, deſign may have improved. The floating of trees on the ſurface of the waters, may have given birth to the uſe of boats; and the hollowing of them fit for paſſage or burden, has been an after invention.

Throughout the globe, we diſcover a promptneſs and ſimilarity of manners that is ſingular. Man differs but little from man in his inventions for the common purpoſes of life: climate and products may vary, but he ſoon learns how to adapt them to his wants and uſes. This is peculiarly verified in the art of ſhip-building in all its various gradations of pettiaugers, proas, boats, ſloops, &c. the knowledge and uſe of them is general. In many countries and iſlands we find veſſels uſed, that have been only ſcooped or burnt out of ſingle trees. The ribbing and planking of veſſels, with the uſe of ſails and oars, and their ſize, conſtruction, and materials, have varied and improved in proportion to the conveniencies and accommodations of the ſeveral climates in which they have been found, and they have been well adapted to the occaſions and wants of man in his moſt untutored ſtate.

Though this ſyſtem and principle has been the ſame, it has belonged to civilization and to commerce among the more enlightened nations, to extend their ideas as their wants have increaſed; and ſhip-building, with all its improvements, is now become one of the greateſt efforts of man in his moſt cultivated ſtate. Notwithſtanding our ſkill, we have yet much to learn, by the application of general principles to many points that have a near relation to the art of ſhip-building. It is not perhaps ſo much a queſtion how to *invent* or *make* a floating body, as how to *govern* that floating body in all its varied forms, by ſome common principles, under all given circumſtances of burden and diſpatch, in the elements they have to contend with.

From the want of uniting theory more with practice, the enquiries of our ſcientifical men have been very limited, and much confined to the ſpeculations of the cloſet. To become more uſeful, their purſuits and knowledge ſhould be applied more to the reſult of experience. Our practical men have neither leiſure or ability to follow up abſtruſe and abſtracted ſpeculations; and it may be admitted as a doubt, whether inventions and diſcoveries, with the improvements upon them, have not been more rapid from among practical men, than from thoſe who have had no experience beyond a ſpeculative and theoretical education. A time may come, when our attention to the higher claſſes of mathematics and philoſophy may lean more to points of practical utility; and perhaps none is more capable of ſtudy and inquiry than ſhip-building and navigation, with all its collateral branches dependent upon utility, health, and accommodations. The French have employed ſome of their beſt Academicians to write on theſe ſubjects, and with much ſucceſs; and the ſhips they have built are ſtrong proofs of the attentions they have paid. We have built from their models, and improved upon them.

No ſhips have differed more from each other than thoſe which have been built upon the ſame models; and ſo much do little cauſes frequently produce the greateſt effects, that the ſame veſſels have been made faſt or dull ſailers, only by a difference in the ſize and poſition of maſts, ſails, and yards, the mode of ſtowage, and of carrying of ſail. Ships are like men, and their tempers are to be managed alike; they are toſſed to and fro, the one by the elements, and the other by the caprice of paſſions. In ſhips much will depend upon the conſtruction; but much more, perhaps, upon management. Each ſize will be found to have a proportion peculiar to itſelf, and adapted to the nature of the ſervice to which it is intended. Fiſhes are of all ſizes, forms, and conſtructions, each claſs having its own proportion, and yet all enjoying the ſame common properties for the element for which they were intended. Ships are of a more complicated conſtruction, and have at all ſeaſons to contend with two elements, which are often at variance with each other, while ſhips are then more the governed than the governing power.

Though much attention has been paid to the choice, age, cutting, and ſeaſoning of timber, and the mode of preſervation, both in the primitive ſtate of timber, and when worked up into ſhipping, yet an increaſing attention may create freſh diſcoveries; and as a few hints may lead on to others, the following are ſubmitted for that purpoſe.

In Sweden, a complaint was made that the timber floating, and ſeaſoning, for the uſe of their navy, was frequently infected with the worm. Linnæus, on being conſulted, found that an inſect depoſited its eggs in the timber: he recommended the floating of the timber under water during the ſeaſon that the inſect laid its eggs: the advice was followed, and the evil remedied.

The following extract of a letter from a Gentleman of conſiderable philoſophical obſervation, and whoſe ſituation gave him great opportunities of hearing the propoſals and projects of others, having found its way into ſome circles, contains ſo much uſeful information, that a liberty is taken in the tranſcribing of it.

" A man

"A man who had been formerly concerned in ſhip-building, but for thirty years paſt has been a bridge-builder, had early in life obſerved, on examining worm-eaten ſhips, that the worm never eat within the ſeams where the caulking-chiſel enters, and the oil, &c. He had obſerved, that the whaleing veſſels would be eaten to a honeycomb, except a little above and a little below water where the whale is brought into contact with the veſſel, and lies beating againſt it till it is cut up. A plank lying under water at a mill of his, had been obliged to be renewed annually, becauſe eaten up by the worm within the courſe of the year: at length a plank was accidentally put down, which for ſome purpoſe had been thoroughly impregnated with oil: it remained ſeven years without being affected. Hence he took the idea of impregnating the timber of his bridges thoroughly with oil, by heating the timber as deeply as poſſible, and doing it in that ſtate with the liver oil of the codfiſh: he had practiſed this for thirty years, and there was no inſtance of the worm attacking of his timbers, while thoſe in neighbouring places were immediately deſtroyed. He had uſed the liver oil of the cod, becauſe very thick, and therefore as he ſuppoſes more permanent in its effect: he ſuppoſes ſome other oils might do, but cannot ſpeak of them experimentally. He ſays, there will be no difficulty in heating the planks of a ſhip after they are put on, as well as before; but I do not recollect his mentioning ever to have tried it in the caſe of a ſhip."

In America, it is not uncommon to bore a hole at the end of timbers, and pour oil into the ſame, from whence it ſoon diſperſes itſelf through the pores. They alſo apply ſalt between the ribs with great ſucceſs. Salt ſhips are known to be well ſeaſoned and laſting.

As the navy makes ſo formidable a part of our power, and of the ſhip-building of this country, it would be a proper queſtion to know the proportions beſt adapted to each rate, ſo as to combine burden, ſailing, fighting, and accommodations for men; attending alſo to the ſize of maſts, and conſtruction of ſails. It may be alſo admitted as a queſtion, What ſized veſſels are beſt calculated for the tranſportation of troops, with reſpect to health, ſafety, diſpatch, and national œconomy?

It would be an object of moment to deviſe ſome plan for the better preſervation of timber between wind and water; to conſider of the beſt mode of ſheathing, coppering, and paying of ſhips bottoms; and what is the beſt preſervative againſt the worm and foul bottoms, when ſhips are not coppered? Whether coppering of the navy has had any effect upon the timber? and, Whether, when in ordinary, it would or would not be adviſeable to let them remain in that ſtate? Whether, from the great wear and tear of a ſhip being principally confined to its upper works, by conſtant ſtraining and expoſure, it might not be adviſeable to ſtrengthen thoſe parts by additional beams, and making the timbers in parts ſtronger? What would be the effect of laying double floors or croſs-ways?

As ſhip-building forms ſo large a proportion of the wealth and the power of the country, the thoughts of ſcientifical men might be turned more to the art itſelf, when connected with all its collateral branches; it might alſo be made more a part of nautical education. At Barcelona, in Spain*, (a country none of the moſt public-ſpirited in theſe points), an Academy is eſtabliſhed for the noble arts, and open to all the world; where all who attend are taught *gratis*, drawing, architecture, ſculpture, &c.---There are ſeven halls, and one of them has a nautical ſchool, where every thing of tables, paper, and maſters are provided at the public expence; it has already turned out above 500 good pilots.—Government *here*, without making *expenſive eſtabliſhments*, might give encouragement, and circulate information by uſeful books, among all the lower and younger claſſes of officers and men.

Societies might be formed, and premiums given for the beſt nautical and practical eſſays on the various branches dependent on navigation. Medals might alſo be ſtruck for ſucceſsful candidates; as honour with ſome may prove as great a ſpur as pecuniary reward†.

Accounts might be invited of the numberleſs accidents that have ariſen, occaſioned by ſhipwrecks, loſs of maſts, rigging, ſails, and rudders, and alſo from leaks, and ſhort allowances of proviſions, with the remedies and ſubſtitutes that have been applied. A ſelection of them might be made for the uſe of the navy and merchant ſervice, which might ſerve as a *vade mecum* in moments of diſtreſs and danger; and to a work of ſo much utility and humanity the Admiralty might perhaps be induced to give encouragement and information. The loſs of rudders, and remedies applied, might be inſtanced in the caſe of his Majeſty's ſhip the Lion, Capt. Cornwallis.

The loſſes of maſts and ſails are innumerable; and it is ſome comfort to thoſe in ſuch diſtreſs to obſerve, that ſhips under jury-maſts ſeldom founder, but ride out the ſtorm like other ſhips; and if they do not make ſuch diſpatch in their voyage, they never invite danger, by a preſs of ſail.

Seamen ſhould be impreſſed with the danger and folly of deſerting ſhips on the firſt alarm, when compared with the ſtill greater riſques, they run from open boats in the middle of the ocean, and with ſhort commons, and no port at hand; alſo, that ſhips have been frequently brought into port when deſerted by crews; and that others have been loſt only becauſe they have been deſerted. A ſeaman ſhould never abandon hope; it ſhould be his motto as well as his ſheet-anchor. He ſhould be ſtrongly impreſſed with the idea, that the buoyancy of a ſhip in itſelf, in all caſes, will keep her long a-float when leaky; that ſhips will even ſwim when the water within is *almoſt* level with the ſea without; that cargoes in themſelves are frequently buoyant; and that if of a periſhable nature, the packages may however add to that buoyancy. The preſervation of the Guardian Man of War, Capt

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* Vide Townſhend's Travels through Spain.

† As navigation is now become ſo univerſal to all the nations in Europe, information, drawings, and models, might be invited from all quarters.

Riou, *is* a wonderful inſtance of hardſhips, perſeverance, and ſafety. The narratives of Capt. Inglefield, Blith, and Wilſon, with many others, might be brought to encourage confidence, and baniſh deſpair.

It might be recommended to officers and ſeamen to encourage among themſelves more the profeſſional knowledge of the pilot. We often find expeditions and voyages retarded or defeated from the want of a knowledge of coaſts and ſoundings, and the truſting always to men or pilots, when the former cannot be procured.

It might be alſo a uſeful project to oblige all Captains, on clearing out of their ſhips from our ſeveral cuſtom-houſes, when paying for lights, &c. to take with them printed directions and drawings of our light-houſes along the coaſts, with their bearings. The expence would be only a few ſhillings; it would circulate information, and ſave many veſſels that are loſt, both outward and homeward bound, from ignorance or want of pilots. Under the patronage of Government and the Trinity Houſe other countries might be induced to make a mutual exchange of papers and information.

Health to ſeamen is a great point of nautical as well as of national importance, and with all our precautions hitherto it is ſtill capable of further improvement. Had Capt. Cook's voyages been only undertaken with the idea of experiments as to health inſtead of diſcoveries, they would have proved a national object, and a bleſſing to ſociety, by adding to the lives, health, and happineſs of a uſeful claſs of men both to the navy and to commerce. Seamen are as prodigal of life as they are of their purſe: and it is incumbent upon us to add to their ſecurity and life, when they riſque ſo much for our wealth and convenience. To guard againſt ſhort commons and long voyages, ſhips ſhould be induced to take in a larger ſtock of proviſions than cuſtomary; and it would be a happy diſcovery, if we could make ſome improvement in the ſalting and preſerving of ſalt proviſions.

Ventilation is another point greatly conducive to health. Ships cannot in all weathers bring their bedding upon deck; and ventilators, as at preſent conſtructed, have been rather of a paſſive than of an active nature.. There is a machine, which from its ſimplicity need not be expenſive, that an ingenious man has invented as a cooler in his manufactory; it is on the principle of a winnowing machine in a box, open at two ends, with a long wooden trough that might be extended at pleaſure; it is worked by one man, and can convey in or out of the hold of a ſhip good or bad air at pleaſure, and to a great extent.

I remember the late Mr. BLACKBURNE the ſurveyor's relating, that when he was at Glouceſter, the gaol fever chanced to prevail there with great virulence; and the object being to ventilate a ſmall room that held about thirty people, it was effected by the means of a ſmall coach wheel, with little ſails placed in a box over the cieling that had a funnel to go out of doors: holes being made in the cieling, the air ruſhed through with great impetuoſity, when this wheel machine ſet to work, and completely ventilated the gaol. It would be eaſy, by means of a wheel or ſome other machine, to ventilate *actively* the hold of ſhips in all weathers, and it would be peculiarly ſerviceable to tenders and tranſports.

I will not lengthen this letter, already too long, by an apology, but congratulate you by obſerving, that there is a new invented patent wheel, to pump ſhips without manual labour, which works, when immerſed in the ſea, by the reſiſtance of the ſhip to the ſea while ſailing; at all times it will be a uſeful diſcovery, and particularly ſo when ſhips are leaky, and their crews are worn down with fatigue and diſeaſe, ſincerely wiſh well to your ſcheme.

I am, Sir,
Yours, &c.
A. B.

June 1791.

No. II.

For the COLLECTION *of* PAPERS *on* NAVAL ARCHITECTURE.

COPY *of a* LETTER *to the* RT. HON. *the* EARL OF AILESBURY.

MY DEAR LORD, *Teignmouth-Houſe*, *March* 7, 1791.

YOUR Lordſhip cannot be indifferent to one of the moſt capital and ſucceſsful inventions which the human mind has ever before produced, and that in one of the nobleſt and moſt uſeful branches of the mechanical arts, I mean Ship-building; and I ſhould ſuppoſe to thoſe who have a predilection or real knowledge in the wonderful ſcience of Navigation, if they can diveſt themſelves of old prejudices, it muſt aſtoniſh and delight them more forcibly than it does me.

The facts which appeared in the firſt trial laſt year at Deptford, and thoſe lately made and now making on the ſeas in our neighbourhood, muſt preclude every kind of prejudice in future from all intelligent examiners; though I am ſorry to ſay, want of candour and penetration in England but too often damps the buddings of fine genius, and depreſſes the fertile inventions of the mind, in moſt new diſcoveries, except where they are ſuſtained and patronized by enlightened underſtandings, which I hope will be the caſe in the preſent inſtance.

In the late fatal war in America Capt. SCHANK had the command of all his Majeſty's ſhips of war on the great lakes (which in fact are little ſeas), under as experienced a Captain and Commander as any in the Royal Navy. During that arduous undertaking, my friend Captain Schank highly diſtinguiſhed himſelf: it was there the invention of ſliding keels for boats originated, and which anſwered beyond expectation, and greatly facilitated our ſucceſs in different parts of the Continent. His great ingenuity in this difficult art has procured him the warmeſt patronage and friendſhip of the Duke of Northumberland, who was an eye-witneſs in America to the great utility of ſliding keels. This does Capt. Schank much credit, as his Grace is himſelf an excellent ſhipwright, and very fond of all nautical improvements.

Laſt year Capt. Schank, ſtimulated by the Duke's perſuaſion, and prompted by his own enthuſiaſm for the ſervice, frankly, and I muſt ſay generouſly, offered his drawings and models of the ſliding keels to Mr. Pitt, who, very properly, ſent them to Lord Chatham and the Admiralty: from thence they were conveyed to the late excellent Comptroller of the Navy, Sir Charles Middleton, who with ſome of the Commiſſioners had penetration ſufficient to ſee that a trial ſhould be made of this curious invention, although the Surveyor of the Navy ſeemed to treat this new conſtruction of building ſhips very ſuperciliouſly, and publicly declared the impoſſibility of its ſucceſs; however, an experiment was to be made, and two veſſels were ordered by the Navy Board to be fitted out, each of thirteen tons, and ſimilar in dimenſions, ballaſt, and ſails; one on the old conſtruction, the other flat-bottomed with ſliding keels.

Sir Charles Middleton, all the Commiſſioners of the Navy, and the Surveyor, attended; and although the veſſel had lee-boards, a greater quantity of ballaſt, and two Thames pilots aboard (which was all unfair), yet Capt. Schank's veſſel with three ſliding keels beat the other veſſel, to the aſtoniſhment of all preſent, one half of the whole diſtance ſailed: and no doubt ſhe would have beat her much more, had ſhe been furniſhed with a Thames pilot, the currents of that river not being known at all to any of his ſailors, was a great detriment to the veſſel's ſailing.

The great ſucceſs of theſe firſt trials with ſo many diſadvantages againſt the ſliding keel veſſel, diſappointed the ſluggiſh illiberal intellects of ſeveral who were ever averſe to any trial: indeed they were too dull to comprehend the depth of this diſcovery, and the advantageous ramifications which naturally proceed from it; they were ſtruck almoſt dumb at theſe ſucceſſes, at leaſt were ſilent. But Lord Chatham and Sir Charles Middleton, much to their honor and diſcernment, were convinced of the ſuperior excellence in the conſtruction of building ſhips on Capt. Schank's plan, in preference to the old method; and therefore it was immediately ordered that a King's cutter of 120 tons ſhould be built on this conſtruction, and Captain Schank was requeſted to ſuperintend its building; which though at conſiderable trouble and expence to him to do, as his reſidence in this neighbourhood is near forty miles from Plymouth, he cheerfully ſubmitted to it, confident at the ſame time, from the illiberality that had paſſed in the firſt trial at Deptford, that he ſhould be conſtrained to ſubmit to many orders of the Surveyor contrary to his own opinions and plan: however, the independence of his fortune, and his predilection for this undertaking, ſurmounted the difficulties that were preſented; and with all the impediments ſo illiberally flung in his way, his plans of conſtruction ſo improperly executed have nevertheleſs been crowned with the moſt unexpected ſucceſs.

This veſſel has lately been launched at Plymouth, and named *The Trial*, a crew of thirty-ſix men appointed, and the command given to *Lieutenant* MALBON, in compliment to Capt. Schank, by whom he was brought up in the Navy, and ſerved under him all the war in America; and who ſeems perfectly ſenſible of the advantages of veſſels built on this new conſtruction.

The effects of theſe trials cannot be better aſcertained than by the Commander's letter to Captain Schank from Portland-Road, after a violent gale, and the certificate of the Officers belonging to the veſſel, copies of which you will find annexed.

You will probably like to know ſome of the many advantages reſulting from ſhips built on this new conſtruction; for it is not the ſailing faſter alone than others of equal ſize that conſtitutes the ſuperior excellence of building ſhips on Capt. Schank's plan, there are many other extraordinary benefits it attaches to our navy and commercial departments. What I have been able to collect from frequent converſations with my friend on this intereſting ſubject, and from the profeſſional men, as well as ſome ingenious ſhipwrights in this place, I ſhall relate to you as briefly as I can; though I hope Capt. Schank, when he has finiſhed his experiments in *The Trial*, will favour the public with a more diffuſe and circumſtantial relation than I can pretend to in this curſory paper.

It is now proved beyond a doubt, that veſſels having ſliding keels will be better ſailers; for it is univerſally allowed, that the longer the floor, the faſter a veſſel will ſail and the leſs ſhe will pitch, both under ſail and at anchor; nor will theſe veſſels ſhip water over the bows, ſo that the veſſel will ride much eaſier at anchor: all theſe advantages, which other veſſels cannot poſſeſs, ſhe gains by the flatneſs of her floor, and its length. This has not only been proved by *The Trial Cutter*, but is alſo corroborated by the Dutch veſſels, which ride out gales of wind in high ſeas, when other veſſels of a different conſtruction are drove aſhore and loſt. But while theſe Dutch veſſels, when on a lee ſhore and under ſail, if they cannot anchor, are then driven on ſhore and loſt; but by the ſliding keels the veſſel has the advantage of avoiding both evils, and may be ſaved from either of the dangers of foundering at an anchor, or driving on a lee ſhore from her anchors, and ſo will beat off ſhore under ſail. Beſide theſe advantages, it is almoſt impoſſible that a ſhip with three ſliding keels, can be burnt or deſtroyed by fire, if built in compartments as *The Trial* is; for inſtantly on a ſhip being on fire in any particular part, water may be let in from the wells of the keels by means of corks, when the water will fill, and riſe up even with the ſurface on the outſide; and as the cargo is in general below the ſurface of the ſea, the whole or any part will be under water when neceſſary, but all that is ſtowed in the other compartments will be perfectly ſafe and preſerved: had *The Guardian* been thus divided, ſhe would have proceeded on her voyage with ſafety, and not any of her ſtores would have been loſt, but a ſmall quantity of thoſe in that part which was broke or ſtaved.

From the above imperfect hints, you will ſee numbers of valuable lives will be ſaved, coſtly cargoes preſerved, inſurances will be diminiſhed, and eſpecially cargoes that are of a periſhable nature will not run above one-ſixth or one-eighth part of the riſk of being deſtroyed, as in other veſſels; ſuch as cargoes of ſugars, rice, rum, ſalt, fiſh, bale-goods, &c. &c. Beſide, a fleet may be kept better together, as each individual ſhip becomes more manageable.

I cannot help obſerving, that though my friend's fortune is conſiderable and independent, and the command of a man of war is no object to him in point of profit, and his time of life, one would naturally ſuppoſe, preferred retirement and eaſe; yet his ſpirit and love for the ſervice induced him to offer himſelf to the Firſt Lord of the Admiralty, during the late armament, if he thought he could be of uſe in his profeſſion.

It is not leſs worthy of remark, that few men, though with the affluent independent income of my friend, would have given up to the public ſuch valuable inventions as are evident in his plans of Ship-building without the leaſt pecuniary conſideration; but his mind is always alive, and occupied in uſeful improvements in his profeſſion, without thinking of mercenary objects.

Beſide, I know very tempting offers have been held out to him from more Potentates than one, to tranſmit himſelf with his fine mechanical naval inventions abroad; and I think too much praiſe cannot be given to Capt. Schank for his refuſal, and, in lieu of acceding to theſe temptations, for having ſo liberally given them to his own country.

The Commander of the Lakes in America alludes to Capt. Mears, under whom and to whom Captain Schank attributes all his naval knowledge.

I am, my dear Lord,
your affectionate and obliged
humble ſervant,
JAMES WRIGHT.

Portland-Road, Feb. 15, 1791.

DEAR SIR,

I HAVE taken the firſt opportunity to acquaint you of our being in Portland-Road. My reaſon for bearing up was, I thought we ſhould not get a pilot. I am not ſorry for it now, for ſhe has had a better trial than ever; ſhe really did every thing but ſpeak. We carried the main-ſail and the jib, with two reefs in the fore-ſail, thirds out by the wind and a heavy ſea, on the weather bow, going ſix knots. I wiſhed to have had one of the Cutters with us; I think they would not have looked at us. Every thing is in good order, and ſhall hope to ſee you again as ſoon as poſſible, and remain

Yours, ever ſincerely.
MICAJAH MALBON.

Capt. SCHANK, *R. Navy.*

[*The* OFFICERS CERTIFICATE *has been already given in* Part I. *of this* COLLECTION.

No. IV.

To the EDITOR *of* PAPERS *on* NAVAL ARCHITECTURE.

THE architectural attempts at improvements in the conſtruction of ſhips, have made ſome progreſs---but hitherto attended with an immenſe unneceſſary expence. The waſte of timber has been infinite, without adding to ſtrength;---on the contrary, the ignorant conſumption has been alſo two to one.

The art of warping of timbers, by a great depth and width of boiling water, has never yet been practiſed in any of the Britiſh ſea-ports. ---Within theſe few years, confined attempts have been made in ſhallow and narrow boilers, and found to anſwer partial purpoſes. It is now practicable to rebuild the whole navy of England ſtronger with one half the oak, by warping every timber to its neceſſary purpoſe by an enlarged ſyſtem of boilers.

This method will prevent a multiplicity of parts, which always conſtitute weakneſs.---The ribs of a ſhip ſhould be horizontal, and lines with inverted arches, deviating in thickneſs as ſtrength requires. Upon this principle the whole length of timber can be preſerved, if wanted, and the thickneſs gained by ſawing, antecedent to warping, without any waſté whatever. At preſent, ſhips are framed of too many component parts, and half the timber waſted in chips. In the cuſtomary mode of ſhip-building, with the ribs upright, they frequently get out of ſhape with their own weight; and if they touch ground, like the Halſewell Indiaman, they divide in two, being conſtructed upon the weakeſt principle in the diſpoſition of materials and multiplied timbers.

If theſe hints cannot be controverted, what reaſons can be given for not carrying them into execution? Safety and ſavings are great points to carry in a warlike and commercial country.

A RIB REVERSER.

No. V.

To the Right Honourable Viſcount HOWE, Firſt Lord *of the* Admiralty.

MY LORD,

I LATELY read with much pleaſure, that you are going to lay down the keels of ſeveral new ſhips of the Line immediately. May I preſume to trouble your Lordſhip with a word or two concerning their names.

It has for ſome years been the mode to call ſhips of war after Heathen gods and heroes of antiquity. I have long thought the moſt famous events and warriors in our own hiſtory would be preferable.

We have now in the navy a Blenheim, a Namur, a Ramillies, and a Culloden: ſurely the names of the more glorious battles by which the kingdom of France was conquered would be as proper for ſhips; and to the Ruſſel, the Montagu, and the Anſon, ſhould be added others of our moſt renowned Admirals, rather than Grecian demigods.

This liſt is according to my ſcheme,

First Rates,---Black Prince, Henry the Fifth.
Second Rates,---Creſſy, Poictiers, Agincourt.
Third Rates,---Howard, Drake, Raleigh, Blake, Albemarle, Rupert, Lawſon, Spragge, Benbow, Rooke, Boſcawen, Hawke.

This ſyſtem would anſwer ſeveral good purpoſes. Our young officers, their fathers glorious conqueſts ever before their eyes, would ſcorn to yield to an enemy ſo often entirely vanquiſhed, and who, on the other hand, would be reminded of her diſgraces and defeats at the bare name of an Engliſh ſhip. Our common ſeamen too, unacquainted with Scipio, Theſeus, Orion, and Saturn, are moſtly converſant with the actions of our brave Admirals, whoſe heroic exploits are handed down in ballads, &c. for whoſe memories they have a reſpect, and whoſe names, being conſtantly ſounded in their ears, would urge them to gain freſh victories, by a recollection of former ones. I likewiſe think my plan might encourage our young tars to read our naval hiſtory more than they now do, by which their minds would be formed to great deeds.

Various names might be found, beſides thoſe mentioned, proper for ſhips of the line; and ſeveral good ones for frigates. Far better than Melampus, Leda, and Dido, would be Columbus, Phillippa, and Roſamond. I wiſh alſo for the immediate rebuilding the two famous prizes the Foudroyant and the Ville de Paris, that our ſeamen may be continually reminded of the moſt glorious engagements in this country between two ſhips and two fleets*.

No. VI.

MONS. DE LANDAIS, of St. Maloes, late an officer in the French navy, who commanded the Alliance French frigate in the late war, and had the ſevere action with Capt. Pearſon, in the Serapis, a very ſenſible intelligent man, and who had made naval architecture his ſtudy from infancy, having ſeen one of MACKENZIE'S MACHINES at Mr. M'CULLOCH's that attracted his attention, was introduced by Mr. C. to ſee the other, which gave him great ſatisfaction, as they appeared ſo plain, and ſaid it was a thought had been long in his mind.

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* This Letter was firſt publiſhed during Lord Howe's Preſidency at the Admiralty-Board.

Much converſation enſued, in which it tranſpired, that he was for univerſal liberty; that he abhorred deſpotiſm, and the great power of kings; approved the French revolution, tho' not in all its parts; had been in the American ſervice, and much approved the Conſtitution of the United States. He however greatly cenſured Dr. **Franklin**, as greedy of popular applauſe, for which he ſacrificed much, and even betrayed his truſt; ſaid, he was a defaulter in reſpect to money entruſted to him from the United States, and had evaded giving any account. He ſpoke much in praiſe of the French marine, and Monſ. **Grognard**, Ingeneur and Hydrographer-general, who has 200 ſtudents under him in the art of conſtruction; and added, that when a veſſel is to be built, its draught is laid before the Society, where every part is calculated and diſcuſſed as to her properties.

No. VII.

An Account of the ſeveral ARTICLES *uſed in* MAKING *a SEVENTY-FOUR GUN-SHIP's MAINMAST.*

				value.		
FISHES for a ſpindle	21 inc.	2 nails of two maſts		101	3	11
Two ſide fiſhes	22	2 ditto		133	10	9
Fore and aft fiſhes	22	2 of one maſt		66	13	10
Fiſh	21½	1 of half a maſt		29	8	5
On the fore part.						
Iron	0	3	19	1	5	9
Aries load baulk	3 loads 22 feet			12	2	5
Breadthning	2	7		11	1	7
Dantzic fir timber						
Cheeks	4	2		20	18	4
Iron	5cwt.	2qr.	24lb.	8	0	0
Knees elm timber		13		0	15	2
Iron	0	2	14	0	17	6
Hoops and bolts on the body	13	1	16	18	15	0
Treſſel-trees ſtrait oak timber 2nd ſort	2 loads 10 feet			10	2	4
Iron	0	3	10	1	3	6
Croſs-trees ſtrait oak timber 2nd ſort	1 load 12 feet			5	14	0
Iron	0	2	2	0	14	6
Cap elm timber	1 load 24 feet			4	6	0
Iron	2	0	14	2	19	6
Fullings, bolſters, ballins, and Dantzic fir	1 load 2 feet			5	7	8
Workmanſhip				78	6	0
				£. 513	11	2
Seventy-four gun ſhip's main-top-maſt				50	16	3
main-top-gallant-maſt				8	11	0

NEW

No. VIII.

OBSERVATIONS *on the* OAK PLANTATIONS, *the* OFFICERS, &c. *of* NEW FOREST *in* HAMPSHIRE.

[From the Rev. Mr. GILPIN's "Foreſt Scenery," lately publiſhed]

THE *woodward* aſſigns timber for the payment of foreſt officers; this is ſold by auction at the court at Lyndhurſt; and annually amounts to about 700l. which is the ſum required.

Under him are 12 *regarders*, who aſſign ſuch timber as is claimed by the inhabitants and borderers for fuel and repairs; of this inferior wood there are great quantities aſſigned on every ſide of the foreſt.

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As New-Foreſt was always conſidered as the great magazine of navy timber, the verderors were impowered, by an Act of Parliament, in King William's time, to fine delinquents to the amount of 5l. in their attachment courts; whereas, in all the other foreſts, the fine does not amount to more than a few pence.

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The *purveyor* is an officer of later inſtitution, ſince timber became valuable as a material; he is appointed by the commiſſioner of the dock at Portſmouth; his buſineſs is to aſſign timber for the uſe of the navy. The origin of this purveyor is not earlier than the reign of Charles II. in whoſe time 500 oaks and 50 beeches were annually aſſigned for the King's yards; and this officer was appointed to aſſign them; but it being found, that the foreſt could ill ſupply ſo large a quantity of oak, inſtead of 500 the number was afterwards reduced to 60; which, together with 50 beeches, are ſtill annually aſſigned.

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In the year 1788, a ſurvey of New Foreſt was taken, by order of the commiſſioners of the land-revenue of the crown; in which ſurvey the following account was given in of its contents:

	Acres.
Foreſt lands - - - - - -	63,845
Lands held with lodges - - - -	1192
Incroachments - - - - - -	900
Leaſeholds under the crown - - -	1003
Freeholds, and other intermediate property	25,422
Total -	92,362 P. 27.

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The ſoil is in general a ſandy loam, well adapted to the production of oak timber; and this tract was long conſidered as one of the great magazines for the navy: it was formerly thought to be inexhauſtible; but, ſo early as in Queen Elizabeth's reign, Manwood tells us, that "the ſlender, and negligent execution of the foreſt law hath been the decay and deſtruction of timber; the want whereof, as well in this preſent time as in time to come, ſhall appear in the navy of this realm."

Manwood's remark was ſpeculation; but in the reign of Charles II. it took the air of prediction: the decay of timber, which had long been gradually coming on, began then to be felt; its ſources failed as the demand increaſed. In moſt commodities the demands of a market immediately produces a ſupply; but timber requires ages to make it marketable. It may be added, that the navy magazines had not then thoſe reſources which they have ſince found: timber was with difficulty brought from the inland parts of the country, on account of the badneſs of the roads; little foreign timber was imported; and the nation was on an eve of a naval war. Charles, who had a ſort of turn for ſhip-building, and had, on that account, a kind of affection for the navy, was eaſily induced to iſſue an order, under his ſign manual, to Sir John Norton, woodward of New Foreſt, to incloſe 300 acres of waſte, as a nurſery for young oak; the expence of which was to be defrayed by the ſale of decayed wood: this order bears date December 13, 1669.

In the 10th of King William, an Act paſſed, impowering certain commiſſioners to incloſe 2000 acres for the growth of timber; and 200 more every year for 20 years afterwards. This provident act was as well executed as it was projected; a very conſiderable part of the quantity preſcribed, at leaſt 4000 acres, were incloſed and planted; and the timber of theſe incloſures is now ſecure from all danger, and is thrown out again into the foreſt: none of it hath yet been felled, as it is not yet in a ſtate of perfection; but it is in a very flouriſhing condition; and is at this day the glory of the foreſt.

In the reigns of Queen Ann and George I. I believe no plantations were made; which is the more to be wondered at, as the ſevere hurricane, in November 1703, did great injury in New Foreſt; not fewer than 4000 of its beſt oaks were deſtroyed, together with great quantities of growing timber.

In the reign of George II. three incloſures were made, but they were injudiciouſly, or diſhoneſtly managed. Some attempts have been made in the preſent reign, but for want of being properly planned, or honeſtly managed, very little advantage hath accrued.

In the year 1782, an inquiry was inſtituted, by an order from the Treaſury, into the quantities of navy timber in New Foreſt; that is, ſuch timber as would meaſure 35 cubic feet: the quantity given in was 52,000 loads; (40 cubic feet make a load) at the ſame time the timber in Dean Foreſt was found to contain 62,000 loads.

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In New-Foreſt, the oaks ſeldom riſe into lofty ſtems, as they uſually do in richer ſoils; but their branches, which are more adapted to what the ſhip-builder calls *knees* and *elbows*, are commonly twiſted into the moſt pictureſque forms.

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Sethorn-Wood was once the nobleſt of all foreſt-ſcenes; the ground it ſtood on is beautifully varied; and the grandeur and number of its oaks were the admiration of all who ſaw them; but its glories are now over. During the unremitted courſe of 30 years it continued to add ſtrength to the fleets of Britain; itſelf was ſufficient to raiſe a royal navy; in this arduous ſervice its vigour was at length exhauſted; and it contains little more at preſent than ſhrubs, under wood, and blaſted trees.

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Near Wilverly-Lodge is a new timber incloſure, which is not leſs than four miles in circumference; but at preſent there is ſo little appearance of the growth of timber, that people are apt to ſuppoſe, it has been ignorantly planted or negligently attended.—One reaſon indeed aſſigned for the ruin of the young wood, is the quantity of rabbits, which breed in the ſandy hills, and which it is difficult, amidſt ſuch ſhelter, to extirpate.

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On the border of Culverly-heath is a large wood called Denny; it has once been a noble ſcene, but is now ſtripped of its principal honours, and conſiſts chiefly of beech, with a few decrepid oaks ſtraggling among them: every where are noble ſtools, of which an idea might be formed by the reſpectable ſpace they have formerly occupied.

Woods of this kind continue as far as Lady-croſs-Lodge.

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Norley-Wood ſtretches about two miles in length; the forms of the oaks are remarkably picturesque; and their combinations are as pleaſing as their forms.

The deſtruction of this wood has been long expected. In the beginning of 1781, a band of wood-cutters entered it, with orders from the Surveyor of the foreſt to cut 100 of the beſt trees, which he had previouſly marked for the uſe of the navy; theſe trees were ſet apart for building ſhips of the firſt and ſecond rates: the next year another fall of the ſame kind of timber was ordered; and in three or four years, when all the noble trees are gone, the refuſe will be deſtined to ſhips of inferior ſize. During ſeven years, it is ſuppoſed, this wood will yield a conſiderable ſupply to the yards of Portſmouth; at preſent, however, a reſpite is given it: if a few more attacks, however, be made upon it, its glory will be extinct; and Norley-Wood, like other ravaged woods, will ſuggeſt only the remembrance of a ſcene.

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Some idea of the depredations committed in the royal foreſts may be conceived from the following account.—Not many years ago, two men of the name of Batten, father and ſon, ſucceeded each other in the office of under-keeper, in one of the foreſt walks. The under-keeper is ſuppoſed to cut holm and other under-wood of little value to brouze his deer; and when the rind and ſpray are eaten off he faggots the dry ſticks for his own uſe; but theſe fellows cut down the young timber of the foreſt, which they made up into faggots and ſold; and, for this paltry gain, they committed waſte eſtimated at 50,000l. damage. The calculation ſeems large, but in 60 or 70 years much miſchief might be done: for though a young ſapling may not be worth more than half a crown, yet the great difficulty of getting another thriving plant, raiſes its conſequence much beyond its ſpecific value.

No. IX.

From The UNIVERSAL REGISTER, 1786.

SIR,

SEEING in your Paper a Letter ſigned *A Friend to the Navy, and a late Servant*, I cannot avoid taking up the pen in vindication of an Honourable Character in the Houſe of Commons; and I muſt aver, that your Correſpondent begins with equivocation: for he ſays, "when a ſhip is taken into dock at his Majeſty's yard at Deptford, to be ſurveyed, &c." Now the fact is, that the ſhips undergo the ſurvey mentioned in the Houſe a-float; that they have ſeldom any planks taken out there; and that they are put into the dock, or ſold out of the ſervice, in conſequence of the report from this ſurvey a-float, which is too often tranſacted in the looſe manner deſcribed by the Honourable Gentleman: from whence it has happened, that ſeveral very good ſhips have been condemned, and that ſeveral bad ones have been repaired at an expence even greatly exceeding their prime coſt.

A FRIEND *to* VERACITY.

March 17.

No. X.

From The UNIVERSAL REGISTER, 1786.

SINCE the Houſe of Commons have thrown the ſtone walls into the ſea, we hear that eminent engineer Mr. KEYSE has made a propoſal for fortifying the dock-yards in his new and œconomical method, after the manner of the grand battery conſtructed by him near the Grange Road, Bermondſey: and there is little doubt of this plan being brought forward; for though it boaſts equal utility, it is liable to none of the objections raiſed againſt the former; the eſtimates will be cheaper by 90 *per cent.* and the works may be manned with the ſame facility and expedition with which they are erected.

No. XI.

From The UNIVERSAL REGISTER, 1787.

To the Right Honourable Lord Viſcount HOWE, *&c.*

MY LORD,

THE CAPTAIN, of 74 guns, was launched yeſterday, at Limehouſe; and it is a melancholy truth, that this is the laſt ſhip of war built or building by contract in the port of London. The ſyſtem of fallacious œconomy which diſcontinues the building contracts, is in the higheſt degree impolitic, and muſt, upon any alarm of war, operate greatly to increaſe the expence of ſhips, while it will render their quality much inferior. The working Shipwrights are a body of men moſt uſeful, even abſolutely eſſential to the State, and the merchants yards on the River Thames are the principal ſchools in which the effective men are trained, and the principal fields in which their exertions can ſerve the Public. Many good Shipwrights are already out of employ; ſome have emigrated, and unleſs ſhips of war are ſet up upon contract, more will emigate; and as the elder ones die off, or become incapable of labour, few or no apprentices will be brought up to ſupply the deficiency. Theſe are part of the immediate inconveniences; and though they are ſuch as may appear, *prima facie*, to affect a few individuals only, yet if we look forward, and take into our view the probable, I may ſay the certain effects of ſuch a ſyſtem, on any future commotion among the States of Europe, ſhips will be built rapidly, the materials unſeaſoned, and the workmanſhip much worſe than when more leiſurely performed; the market for timber will be more quick, and conſequently great competitions for the purchaſe will exiſt: this muſt raiſe the price of timber, and co-operating with a ſimilar competition among the builders in procuring workmen, and in taking the contents, the price of labour as well as of materials, and, ultimately, the price of ſhips muſt increaſe in a very conſiderable degree. It is likewiſe to be ſuppoſed, that the pernicious mode of contracting for ſhips in the out-ports would be removed; I call it a pernicious mode, becauſe an impartial review of its effects in the late war will evince that it was not generally beneficial to contractors; a fact which ſome of their names having appeared in the Gazette will teſtify; and in a national view, the ill effects of it are obvious to every one converſant in the buſineſs. Theſe ſhips were in general conſtructed in an inferior manner, and with what the London Builders had rejected: a conſiderable number of the Shipwrights who worked upon them were ſeduced by great wages from the River Thames. This circumſtance took from the ſtrength of the London Builders, and operated as an abſolute diminution of workmen to the State; becauſe it is well known that two men can expedite as much work in a River-Yard, where there is conſtantly a large ſtock of materials, kilns for boiling the plank, and many other expenſive conveniences at hand, as three can do in the country, where the ſtock is generally ſmall, and many requiſites wanting. Few of the countrycontractors having completed their ſhips till long after the expiration of their ſtipulated time, verifies this aſſertion; and it is evident, that as the number of Shipwrights in the River was reduced by thoſe draughts into the country, the price of the labour, and conſequently the price of building, was greatly enhanced. It may be added, that beſides much delay, a great expence was incurred by ſending people, boats, &c. from the King's yards to aſſiſt in launching theſe ſhips, in getting them a-float when they had grounded in creeks, or overſet in launching, &c. and in ſending round and getting in rigging and jury-maſts, &c. and in bringing the ſhips to the ports from whence they were to be fitted; inſomuch that if a fair account was ſtated, it would be found that theſe ſhips (though contracted for at a lower price) coſt Government much more than the ſhips built in the River. Having ſtated the probable reſult of a ſuſpenſion of contracts for building in the River, I ſhall proceed to point out ſome of the advantages which would accrue from the continuation of them.

If one ſhip of the line was to be ſet up in every principal private yard, and a frigate in ſome of the next claſs; which ſhips ſhould be three years in building, and ſhould ſtand to ſeaſon one year of the time with the plank all wrought, and faſtened with a few bolts, the trenail holes all bored and left open (a ſyſtem of ſeaſoning the credit of which, I believe, is due to the Eaſt India Company's Surveyor, and which is much preferable to ſhips ſtanding in their frames); the ſhips ſo built would promiſe to be very durable; and as their progreſs would be very ſlow, the Navy Surveyors and Overſeers would have time more minutely to inſpect the work and materials. As there would be no hurry, there could be no violent competition; the market for timber would conſequently be eaſy, and the price moderate; the Builders and their officers would bring up apprentices; the workmen ſome; labour would of courſe be more reaſonable; and the combination of theſe circumſtances would enable the Builders to take the contracts on lower terms: add to which, that on the breaking out of a future war there would be leſs neceſſity for diffuſion of contracts, or for building ſhips with detrimental haſte, while, on an emergency, there would be no want of workmen, where particular diſpatch ſhould be required.

It is to be lamented, that a very unfavourable idea of ſhips built by contract has been long entertained by many gentlemen of the Navy; an idea which I fear has in ſome inſtances been ſtrengthened by Country-built ſhips: but I think, no doubt that your Lordſhip, whoſe flag long honoured the maſt-head of a contract-built ſhip, is convinced that the prejudice is very unjuſtly extended to the work of the reputable Builders in the River; and I have obſerved, with pleaſure, that even the Officers of his Majeſty's yards begin to lay aſide (with their white wigs) that illiberal opinion.

The great fortunes alledged, or ſuppoſed to have been made by the River-Builders, has been no ſmall ſubject for envy and for reproach; but I will venture to aſſert, that no ſet of contractors who have ſerved Government have made ſmaller profits, in proportion to the amount of their contracts, though it muſt be confeſſed that none ever merited larger. I ſhall conclude with ſuppoſing that this letter will be certainly attributed to the pen of a Builder in the River; but I muſt acquit the whole body of the charge, and aſſure your Lordſhip that I can, with the moſt implicit adheſion to truth, ſubſcribe myſelf A DISINTERESTED OBSERVER.

XII.

From The TIMES, *October* 20, 1788.

To the Right Honourable Viſcount HOWE.

MY LORD,

I TAKE up the pen in hopes of drawing your Lordſhip's attentio to an evil, which, though of recent exiſtence, forebodes an increaſe evident evidently operating to the great inconvenience of the Navy, and conſequently to the great detriment of the nation. The evil I allude to is the extended dimenſions of ſhips lately built, and now building, for the India Company's ſervice. Many of theſe meaſure nearly as many tons as a 64 gun ſhip, and their ſcantlings are larger, for in ſome parts they even exceed thoſe of ſhips of 74 guns; inſomuch that theſe ſhips require and conſume the ſame claſs of timber with ſhips of the line. And the Navy Purveyors, as well as all other perſons converſant in the buſineſs, can inform your Lordſhip, that there is already a great ſcarcity of timber of the above deſcription; and if the ſalutary interference of Parliament does not put a ſtop to building ſuch ſhips, large timber will become more ſcarce; and in caſe a future war ſhould demand great naval exertions and diſpatch, Government will not only be obliged to pay a much higher price for timber, but as it muſt be ſought in parts of the country hitherto unexplored, on account of the diſtance from water-carriage, ſuch delays and diſappointments will ariſe as may tend to the fruſtration of well-planned expeditions, and even give to our enemies a decided advantage. Having ſtated the national inconvenience, if it was not foreign to my preſent purpoſe, I think I could point out that ſhips of ſo large dimenſions are not likely to prove ultimately profitable even to the India Company; but I hope I have advanced ſo much as may induce your Lordſhip to take the ſubject into conſideration, or that at leaſt the feeble efforts of my pen may prompt ſome more able to adopt a topic which I cannot but conſider as being of great conſequence to the welfare of the State.

I am, my Lord, &c.

NAUTICUS.

XIII.

To the EDITOR *of* The TIMES.

SIR,

I WAS ſurpriſed to read in your Paper an advertiſement from the Navy-Office for a Tranſport Ship, with the ſpecification of *North-Country built*. It is true indeed, that an erroneous opinion of ſuperior ſtrength in thoſe ſhips has been long entertained by ſeamen and others not well verſed in Ship-building; but it is nevertheleſs to be wondered at, that ſuch an error ſhould continue to be cheriſhed by a Board, of which one Member being always a Shipwright, muſt be ſuppoſed capable of detecting and expoſing the fallacy. It is a fact well known to every one converſant in timber, that the oak of the North is inferior in quality to that of the South of England, and that very little of the former is convertible to plank, with which article the Builders of the North are chiefly ſupplied from the Southward, generally taking off that which is refuſed by the purchaſers on the Thames. The inferiority alſo of the workmen of the North to thoſe of the River, exceeds even that of their materials; and every obſervant and impartial Shipwright, whoſe lot it has been to ſee the progreſs of Ship-building in the North, or ſhifting of thoſe ſhips for repair or breaking up, muſt be convinced that in the conſtruction of the greateſt part of them, little regard is paid to the ſhift either of the timbers of the plank, in which the ſtrength of the ſhip materially conſiſts, while the iron-work is uſually very ſmall, and often very ill driven. In ſhort, upon the whole, thoſe may be pronounced to be weak and bad ſhips, in compariſon with thoſe built in the River; for while in moſt manufactures a great preference is given to the articles which are *Town-made*, I know of no branch into which ſuch preference is more juſtly due than in ſhipping. It is probable that this Letter may be aſcribed to River-Builders, but in that caſe I can with great truth aſſure you that the imputation will be unjuſt, and that I am perfectly

DISINTERESTED.

XIV.

To the EDITOR *of the* EUROPEAN MAGAZINE.

SIR,

OBSERVING on the Cover of the EUROPEAN MAGAZINE for *June* laſt, a Letter directed to Lord HOWE ſigned *A Diſintereſted Obſerver*; and another ſigned *Diſintereſted*, both evidently calculated to create a prejudice againſt the Northern Ship-builders; I cannot ſee a Society expreſsly inſtituted for the Improvement of Naval Architecture attempted to be miſled upon its firſt ſetting out, without offering a few words in vindication of provincial Ship-building. I am neither a Ship-builder, nor *a Diſintereſted Obſerver*; every man is intereſted in the welfare of his country—and what can ſo effectually contribute to it as an extenſion of Commercial Navigation, protected by a well-appointed Navy? Your correſpondent ſays, "It is a fact well-known "to Ship-builders, and every one converſant in timber, that the oak "of the North is inferior in quality to that of the South of "England; and that very little of the former is convertible to "plank, with which article the Builders of the North are chiefly "ſupplied from the Southward, generally taking off that which is "refuſed by the purchaſers on the Thames." Your Correſpondent muſt excuſe me for denying this *in toto*. The oak of the North is not inferior—Is not mountain mahogany of a firmer texture than that produced in the flatter countries? Is it not ſo with oak?—Is it not ſo with every kind of wood? Was your Correſpondent at all acquainted with the North, he need not be told that wood is longer in coming to maturity in the North than in the South, and conſequently muſt have a cloſer fibre, and of courſe be more fit for ſhip-building. But why ſhould it be inconvertible into plank? It is as ſtraight, and it is as crooked as oak in general; and the ſtoves, and other conveniencies are as perfect, and even as common in the Yards of Liverpool and Lancaſter as in thoſe of London: nay, the conveniences I contend are greater; for land being cheaper, their Yards are larger, and therefore their timber can ſeaſon more naturally; and not ſo much time and labour become loſt by removal to find the pieces wanted, as in more contracted Yards. That the Northern Builders ſhould be obliged to take up with the refuſe of their Southern brethren is alſo a paradox, when timber can be bought cheaper in the North than in the South: and as to Southern Builders purchaſing in the North (particularly the North-weſt), North-weſt), the carriage and other expences render that impoſſible. The Northern Builder is alſo charged with ſeducing carpenters from the Thames—Now the North-weſt of England is a nurſery for carpenters; and if your Correſpondent will take the trouble to walk into the King's Yards, or the private Yards about town, I would lay him a ſmall wager he finds more hands from that quarter than from all England beſides. The iron work alſo comes in for its ſhare of obloquy—how ſhould this be, when every blackſmith knows, that no tough iron can be made from Engliſh ore without that of Lancaſhire? Now is it probable, that iron ſhould be worſe where it is produced and manufactured than at a diſtance? Though this *Diſintereſted Obſerver* declares himſelf no Ship-builder—he could ſcarcely ſport ſo many charges without a motive; and why a diſtant part of the profeſſion ſhould be traduced without better proofs of delinquency, muſt be beſt know to himſelf. But I take upon me to ſay, that the partiality of the Navy-Office in favour of North-country built ſhips is well founded, That they are in general ſtronger built, more fit for tranſports, and will ſtand a ſtorm, or ground better than moſt others. Why did Captain Cook chuſe them for his arduous circumnavigation? Whence ariſes the prejudice (your Correſpondent mentions) that ſeamen have for North-country ſhips? Certainly from experience.

I am, SIR,
With hearty good-wiſhes for due ſupport and ſucceſs to the
Society for Improving Naval Architecture,
Yours, &c.
A BOREALIAN.

XV.

To Mr. SEWELL.

Dear Sir,

I AM much obliged to you for the ſpecimens of the *Common* and *Durmaſt Oaks* of the *New Foreſt*, which you received from Mr. Nichols *, for I am thereby enabled to ſettle beyond a doubt, that the latter is the ſame with the firſt ſpecies of Miller, and the *Quercus cum brevibus pediculis* of Ray †. It is alſo the ſame with what we know about London by the name of the *Norwood Oak*, as I am aſſured by ſome ſpecimens with which I was favoured at the ſame time by Mr. White, of *Fleet-ſtreet*. The two leading circumſtances in which the *Durmaſt Oak* of the *New Foreſt* and the *Norwood Oak* agree with each other, and differ from the *true Engliſh Oak*, are, that the acorns grow in cluſters cloſe to the twig, or very nearly ſo, and the leaves are ſet on ſhort petioles or leaf-ſtalks, uſually about half an inch in length; whereas in the latter, the acorns grow ſingly, or at moſt two together, on peduncles or fruit-ſtalks, from an inch to two inches in length, and the leaves ſit cloſe to the twig, without the intervention of any foot-ſtalk. Though theſe two Oaks are commonly looked upon as Varieties only, yet one can hardly help thinking with our famous **Ray** and Mr. **Miller**, that they are really diſtinct ſpecies, conſidering that they have two ſuch remarkable differences, which ſeem to be permanent. Your ſenſible Correſpondent, I perceive, in the letter which accompanies the ſpecimens, obſerves, that "the leaves differ very much, not only in form but in colour; the *Durmaſt* when freſh being of a yellow green on the upper ſide, and a pale green on the under: the bark alſo of the *Durmaſt* is of a lighter colour and ſmoother than that of the *Common Oak*, and the tree altogether has a very different appearance; and we find by experience, that the wood is not ſo ſtrong, or of ſo firm a texture, though the tree grows to as large a ſize as the *Common Oak*, upon ſoils of ſimilar qualities." Of this Mr. **Nichols** gives an inſtance, in one which was felled in Langley-Wood, about 32 years ago, in which there were 23 loads of ſquare timber: it was ſent to the Dock-yard at Portſmouth.

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* Purveyor of the Navy for Portſmouth Dock-yard, author of "Obſervations on the Propagation and Management of *Oak-trees* in General, but more immediately applying to his Majeſty's *New Foreſt* in *Hampſhire*:" a moſt excellent treatiſe, highly meriting the attention of the Public; and which, with his permiſſion, we have reprinted in this Part of our Collection.

† The *Oak* with the acorns on ſhort fruit-ſtalks.

It is remarked by others, that the leaves flowers and fruit appear later than thoſe of the *true Engliſh Oak*; that it frequently retains its leaves all the winter; that the acorns grow from 4 to 12 together in a cluſter. The form of the fruit is not to be depended upon; both ſorts bearing indifferently acorns ſhort and thick, ovate, oblong, and taper. Neither is any great dependence to be placed on the colour, or even the form of the leaves. Mr. **Miller** affirms, that thoſe of the *true Engliſh Oak* are not ſo deeply ſinuated as thoſe of the *Durmaſt*, nor are they ſo irregular, but the indentures are oppoſite, like the lobes of winged leaves. One tells us, that the leaves of the *Durmaſt* are of a deeper green than the *Engliſh*; others, on the contrary, that the latter are of a deeper green than the former.

On a careful examination of the ſpecimens from the *New Foreſt* and from *Norwood*, I find that the leaves of the *Durmaſt Oak* from the former place are remarkably different from thoſe of the *true Engliſh ſpecies*, being rather ſerrated about the edge than ſinuated; the indentures much more frequent, five ſix or ſeven on each ſide, whereas in the *Common Oak* there are only three or four, forming wide ſinus's, and blunt at the end, whereas in the *Durmaſt Oak* they are generally ſharp. When I received the ſpecimens, the backs of the leaves were of a hoary gray colour, and the ribs inclining to purple; but whether they are ſo when freſh I cannot ſay. The leaves are not entirely unlike thoſe of the Spaniſh Cheſnut, only broader in proportion to their length. The leaf of the *Norwood Oak* has not that remarkable difference which I have endeavoured to deſcribe in the *Durmaſt Oak* from the *New Foreſt*, but differs little or nothing, as I can obſerve, from that of the *true Engliſh Oak*: ſince however it has the ſeſſile cluſtered acorns, and the leaves on foot-ſtalks, I heſitate not to ſet it down for the ſame ſpecies; for, as I have obſerved before, we ought not to lay too much ſtreſs on the form of the leaves.

Mr. Ray, in his Hiſtory, affirms that the *Oak* with acorns on long fruit-ſtalks is the only ſpecies found wild in England; but in the Synopſis the *Oak* with acorns on ſhort fruit-ſtalks, or the *Durmaſt Oak*,

Oak, is ſaid to have been obſerved by Mr. Bobart, in *Bagley-Wood*, and divers other places, and about *Newbury*, to be called the *Bay-oak*.

Mr. Miller, who has diſtinguiſhed theſe two *Oaks*, has blundered unaccountably, in making that which has ſeſſile acorns, and leaves on foot-ſtalks, the *Common Oak* of this country. Dr. Hunter, in his edition of Evelyn's *Silva*, has copied this miſtake.

I ſhould not have dwelt ſo long on a matter of mere ſpeculation. But if the wood of the *Durmaſt Oak* be not ſo ſtrong, hard and durable as that of the *true Engliſh ſpecies*, it is of importance to know how to diſtinguiſh them, that we may avoid cultivating the inferior ſort. It was probably for want of this knowledge, as Mr. Nichols obſerves, that ſome of the incloſures made in the *New Foreſt* in 1700 were planted with acorns taken from the *Durmaſt Oak*.

To you, Dear Sir, who are ſo well convinced of the intimate alliance which ſubſiſts between your favourite *Naval Architecture* and the *Plantation of genuine Engliſh Oak*, I make no apology for this long letter; being,

Dear Sir,
Your's moſt ſincerely,
THOMAS MARTYN.

Park-Proſpect,
Oct. 12, 1791.

No. XVI.

To the EDITOR *of the* EUROPEAN MAGAZINE.

Plymouth, Sept. 3, 1791.

SIR,

FROM a number of experiments made on the virtues and efficacy of Treble-distilled Oil of Tar, and all proving ſucceſsful, I have long wiſhed for an opportunity of introducing this valuable article (of which I am the Manufacturer) into general uſe, and eſpecially in the Royal Navy; but forbore to do it until ſome occaſion ſhould preſent itſelf, of ſhewing, from reſpectable authority, the great efficacy of this invaluable Oil as an *Antiſeptic*. This I think is now obtained by a paragraph in a Letter from John White, Eſq. to the Preſident of the Medical Society, London, (a copy of which is annexed) together with Mr. Cowdry's Return to the Admiralty, from Mill Priſon, in the laſt war; which I think amounts to a conviction of its great utility in purifying the air, and contributing much to the health of perſons neceſſarily confined in ſmall ſpaces. If you ſhould at any time be convinced from experience that I have not ſaid more of this article than it merits, I have no doubt but you will join in recommending it to the Hon. Navy Board, to make it part of the Ships ſtores; and I believe you will find it a very comfortable part indeed, more eſpecially in warm climates.

I am, very reſpectfully,
SIR,
Your moſt obedient Servant,
EDMUND SAUNDERS.

P. S. The price of this article is only Eighteen Pence per Gallon.

†‡† Where this **Oil** is not to be had, a very good ſubſtitute ma found in my Patent **Black Varniſh**, now in general uſe, whe can conveniently be uſed, as the Liquid Part of that article is very Oil of Tar.

EXTRACT from the Journal of **John White**, Eſq. Surg General to the Settlement of New South-Wales, and Correſpo ing Member of the Medical Society of London; taken from **European Magazine** for Aug. 1790. Page 105.

“ON the 23d (June 1787) the weather being exceedingly wa and cloſe, with heavy rain; a temperature of the atmoſphere common on approaching the Equator, and very much to be drea as the health is greatly endangered thereby; every attention wa conſequence paid to the people on board the Charlotte, and every ertion uſed to keep her clean and wholeſome between decks. My care was to keep the men, as far as was conſiſtent with a regular charge of their duty, out of the rain; and I never ſuffered the c victs to come upon deck when it rained, as they had neither linen cloathing ſufficient to make themſelves dry and comfortable after ting wet; a line of conduct which cannot be too ſtrictly obſerved enforced in theſe Latitudes. To this, and to the frequent uſe of O of **Tar**, which was uſed three times a week, and oftener if found ceſſary, I attribute in a great degree the uncommon good health enjoyed. I moſt ſincerely wiſh **Oil of Tar** was in more general throughout his Majeſty's Navy than it is; if it were, I am cer that the advantage accruing from it to the health of ſeamen, truly uſeful and valuable claſs of the community, and for whoſe ſervation too much cannot be done, would ſoon manifeſt itſelf. T efficacious remedy wonderfully reſiſts putrefaction, deſtroys ver and inſects of every kind; wherever it is applied overcomes all agreeable ſmells, and is in itſelf both agreeable and wholeſome.”

The following is the **Copy** of the **Return** made by Mr. Cowd at the End of the War, viz.

MILL PRISON, PLYMOUTH.

An Abſtract of the PRISONERS of WAR received into the C tody of Mr. **William Cowdry**, Agent; together with thoſe have died, and entered into the Royal Navy, from the 27th M 1777, to the 5th of May 1783.

Number received	Entered into the Royal Navy	Inoculated for the Small Pox	Died in the Small Pox	Died natural Deaths	Died of Wound
11,398	339	192	4	173	9

Signed, WILLIAM COWDRY,
Agent for Priſoners of War.

The beſt method of uſing this TAR OIL is with a Painting-Br on the neceſſary parts of the rooms, or pieces of boards or paper der ſick-beds, and occaſionally repeated in ſmall Quantities. **Cowdry** has often ſaid, that he verily believeth the uſe of this had ſaved the lives of Hundreds; and further, that there was ſcar bug, louſe, or flea, to be found in the Priſon, for that the Oi **Tar** had deſtroyed them all.

END OF THE SECOND PART.

AN
ESSAY
TOWARDS A
ENERAL VIEW
OF THE
Literature of the Art of Ship-Building.

INTRODUCTION.

THE noble ardour to enlarge the bounds of human knowledge, and
to promote uſeful arts, that inſpires every man who feels himſelf
equal to that taſk, did very often miſlead genius into enquiries
r objects where many of its efforts were waſted, if not entirely, yet
ainly for a conſiderable part ; and that muſt be always the caſe, if ſuch
cts have been already inveſtigated by others. This ſeems to be the
cipal origin out of which aroſe the many diſputes about inventions
claims to the honour of being the firſt inventor, that in many a caſe
e the inventions have occurred about the ſame period have been unjuſt
oth ſides, ſince it is not only poſſible or probable, but very certain,
different ways may lead to the very ſame end. Many of theſe diſputes
d have been avoided, if the inventors had publiſhed the train of
ghts which conveyed them to the laſt inference. But Genius commonly
enemy to rule, and the leading bridle of cold reaſoning ; he franks
wn way, and in many a caſe would be very embarraſſed, if he ſhould
liged to trace back again by ſingle ſteps the way to the firſt point
whence he ſet out.

w are endowed with ſo much ingenuity as to enable them to pro-
human knowledge beyond the bounds wherein they found it en-
; therefore the principal taſk of by far the greater number that ap-
emſelves to arts and ſciences, ſhould be an ambition to acquire a com-
knowledge of what has been done for them by their anceſtors ; and
uch as are happily fitted out by Nature with the higheſt degree of
uity, would be in many a caſe the more certain of the ſucceſs of their
ations, if they had acquired a complete knowledge of the true ſtate
t art or ſcience that is ſo happy as to become the principal object
ir reſearches, before they proceed on new diſcoveries. Beſides the
r certainty enquiries of that kind would afford to them not to apply
higher qualities in vain, it would point out to them the objects
n they might apply their ſuperior ſkilfulneſs to the higheſt advan-
others.

This aſſertion, I hope, will not be miſtaken ſo far as to be declared for a very odd pretenſion, that every point or matter that may be regarded as once ſettled, ſhould always remain ſettled in the ſame manner, never touched again, and put up, or laid aſide, like a ſentence of the higheſt court of juſtice, as an object quite out of all farther enquiries. On the contrary, I am very ready to acknowledge the great utility of conſidering the very ſame object in different points of view, and to declare any new confirmation of a matter regarded as entirely ſettled, if it is derived from principles different from thoſe whereon it had been eſtabliſhed formerly, as a true gain for human knowledge; my intention being only to ſhew the uſe we ſhould make of the knowledge of what others have done before us, to excite attention towards the ſources wherefrom we may gather it.

The beſt ſources of this knowledge for any particular art, are indeed thoſe men who in every age are the moſt ſkilful in it; but theſe are not always of a communicable diſpoſition; and if they are ſo to the very higheſt degree, their fund of knowledge commonly will be acceſſible only to a very few, and by far the greater part will be obliged to apply to other ſources not quite ſo inacceſſible. The ſtudy of the works produced by the moſt ſkilful men would be another ſource, but certainly not for the beginner, as it requires already a familiarity with the art, to diſcern the particular intention of every ſingle part, and its influence to the perfection of the whole of a maſter-piece; and as true maſter-pieces of every kind are in general equally ſeldom to be found as ſuch men who are able to produce them, this ſource will be of an acceſs almoſt as difficult as the firſt-mentioned. Happily there is yet another ſource of knowledge of a leſs difficult acceſs to be found in the hiſtory and reſult of the reſearches that ſkilful men have left to the world in their writings.

An examination of the advantages and defects peculiar to each of the mentioned ſources of knowledge would carry us too far from the ſcope of this Eſſay, ſince every thing relating to the two firſt-mentioned is entirely individual, and ſhould, if properly conſidered, require a larger explication than reaſonably may be expected in an Introduction to a ſketch or ſurvey of the principal and beſt known acceſſes to the laſt ſource of any particular art, and particularly of the moſt uſeful and moſt noble art of ſhip-building. Though it will not be found improper to remark in a few words, that this laſt ſource for every art whoſe perfection depends equally on deep theoretical and diffuſed practical notions, like ſhip-building, may be recommended the more for its uſefulneſs, as it affords a more general and comprehenſive idea of the perfection to which it has been promoted by the common efforts of theoretical and practical ingenuity of men of the higheſt talents, and points out what remains yet to be done to promote it to the deſired perfection; which ſeems to be a complete confidence that the productions of this noble art may anſwer to every intended deſtination.

It is not to be expected that all men who have been authors of literary productions relating to that art ſhould have been ſkilful in the ſame degree, and ſhould have contributed with the ſame ſucceſs to its perfection; but even the miſcarriages of ſome will be inſtructive, and the ſhoals whereon they wrecked or contracted damage may prove a warning to their ſucceſſors, and demonſtrate to them the high neceſſity to be careful in forwarding the reſult of their meditations without having adapted them to experience and obſervation. A neglect of this ſeems to be the reaſon why till at preſent the progreſſes to the theoretical perfection of the art have been advancing but very ſlowly; as on one ſide men of ſufficient theoretical knowledge to promote it have been in general neither practical mariners nor ſhip-builders; and on the other ſide, the attention of men of the largeſt practical ſkill, by the innumerable quantity of objects that come into their conſideration, has been diſtracted ſo far as to leave them almoſt no time to cultivate their acquaintance with the theory to that degree of familiarity which is required to eſtabliſh by them the true principles whereon their obſervations and experiences are founded. However, it ſeems to be indiſputable, that till the preſent time practical men did more real ſervices to the art than mere theoriſts; though it is undeniable that a happy combination of good theoretical principles with practical ſkilfulneſs in the ſame ſubject, has, wherever it has been found, always contributed much more rapidly to the perfection of the art, than the joint efforts of men who had a claim to either of the two-mentioned abilities ſeparated from the other. Hence it is probable, that a more cloſe alliance of both will prove of the ſame utility for the future, and convince theoriſts of the indiſpenſable neceſſity of a practical familiarity with every circumſtance that may have an influence, and that nothing but a fair experience can be the true guide of a well-ſuiting theory, and practical men, in what manner ſufficient theoretical knowledge may be able to account for their experiences, how it will guide them in making theſe experiences the more fairly, and in eſtabliſhing the rules of the art, by furniſhing the moſt ſolid foundation to ſtand on.

The happy undertaking of the Editor of this Series of Original Papers ſeems to give a very fair proſpect to the eſtabliſhment of this long wiſhed-for combination; and the ſupport he has obtained hitherto from theoretical and practical men found a moſt ſanguine hope of its high utility to the art of ſhip-building in general, from the deepeſt theoretical enquiries to the ſmalleſt object of naval œconomy; and this hope would ariſe to the higheſt degree, if it ſhould be poſſible to turn the attention of a nation and a government like the Britiſh towards it, whoſe wealth and grandeur are ſo dependent on the perfection of that art, and whoſe Sovereign gives ſo many demonſtrations of his inclination to ſupport every uſeful art which applies for his gracious protection.

It will not be found impertinent to put at the head of the firſt Collection of Original Papers relating to Ship-building communicated to the Editor a general view of the literature of that art; to give a ſhort ſketch of what theoretical and practical men have done for it in their writings; and to point out the character of them in ſuch a manner that this general view may be ſufficient to lead the enquiries of the beginner where he may apply for advice about any particular branch of the art, and afford an occaſion to the more inſtructed to inform himſelf of what remains yet to be done for promoting the art of ſhip-building to its perfection. As there have not been (as far as I know) any former Eſſays of this kind, excepting what will be mentioned hereafter, this firſt endeavour certainly will be neither perfect nor complete; but it will afford an opportunity to others to render it the more ſo, by a kind communication of what they know about the ſubject, which will be gratefully received and forwarded to public utility in the following PARTS of this COLLECTION.

As to the characters of the books that will be ſhortly reviewed in the preſent Eſſay, it will be neceſſary to obſerve, to avoid all miſrepreſentations, that they are given fairly ſo as they appear to its author, who, as a private man, has not the leaſt claim to infallibility; and if it ſhould happen that ſingle books may appear to others to be quite the contrary of what they ſeemed to be to him, yet he hopes that his aſſertions in general will be found, a little more or leſs ſo, conformable to the individual manner of regarding things by every impartial man. Some of the books introduced the author does not know at all, and then he can only relate how others have judged of them; but whenever this happens to be the caſe, it will be duly noticed.

At the concluſion of this Introduction the Author begs leave to remark, that, being a German, he hopes his claims to pardon for faults committed by him againſt the Engliſh diction will not be rejected, but kindly agreed to, and the faults themſelves overlooked.

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PARTICULAR writings treating of the literature of the art of ſhip-building I do not know. Many of the writings about the art of ſhip-building mention others that have been publiſhed before them on the ſame ſubject, but commonly they give only the names of their authors; and if they produce the titles of the books, they do it in a very abridged manner.

Mr. Bouguer is the firſt that gives a complete liſt of all former writers on the theory of ſhip-building; but of their works he gives only the titles in the aforeſaid abridged manner.

The completeſt catalogue of theoretical writings on ſhip-building is contained in the *Examen Maritime* by *Don George Juan, tome* 1. preface ii. ix. See Sect. II. of this Eſſay, No. 5.). Don Juan very judiciouſly points ut the contribution of every ſingle book to the progreſs of the theory of the art; and as he mentions ſeveral that I never could get within my reach, I took him for my guide in the ſtatement of the literature of the theory, with exception of the laſt contained in the Second Section of the following Catalogue, in ſuch a manner that the judgment of the laſt from No. 15. of the Second Section to the end is only my own. Beſides this, I have taken care as far as poſſible to complete the literary knowledge, of which he gives the moſt principal, by the production of the complete title-pages, and the various editions of ſome, as far as I have been able to get copies of them.

Probably the *Journal de Marine, ou Bibliotheque raiſonée de la Science du Navigateur, par M. Blondeau*, publiſhed at *Breſt*, would have furniſhed good notices of many books belonging to the art; but unhappily it had no ſucceſs. There are exiſting a few numbers of it that came out, with ſeveral interruptions, about the year 1780; but my endeavours to get them have been in vain.

The third volume of the French *Encyclopédie Marine* (ſee Sect. II. No. 18.) contains at the end a catalogue of books able to form a *Bibliotheque de Marine*; but it is very defective, and does not contain by far a complete enumeration of the books in any branch of naval knowledge: it is not even complete in the French authors (though on many other conſiderations a valuable collection); and ſeems to be a copy of the catalogue of the collection of books belonging to the *Academie de Marine* at *Breſt*. What renders this conjecture the more probable is, that to ſeveral books there is marked the number of copies.

The art of ſhip-building has in every language a great number of technical terms, that muſt be familiar to every one who wants to make uſe of what has been written in any particular language relating to it. This circumſtance will be a ſufficient apology for mentioning firſt, in the Firſt Section of this ſketch, ſeveral books wherein the ſaid technical terms are explained. Moſt of them are calculated not to explain the technical terms of ſhip-building only, but alſo the terms of every branch of maritime knowledge; and in many other books that will be mentioned hereafter are to be found explications of theſe terms in an alphabetical order; but theſe contain commonly, with exception of a few, nothing more than the moſt current, and leave us in uncertainty about the reſt, which commonly are the moſt wanting of an explication.

The books relating properly to the art of ſhip-building are in the following Catalogue arranged in two following Sections; the ſecond containing the theoretical, and the third the practical works. The ſingle books in every Section are arranged in a chronological order, if this is not interrupted by a ſeries of productions connected with each other by a particular relation. Beſides this, there are annexed to the firſt of theſe Sections ſeveral books relating to the management, working, or manœuvring of ſhips; and to the ſecond, ſome inſtructive particular tracts relating to ſingle objects connected with the practice of ſhip-building.

SECTION I.

BOOKS

RELATING TO THE EXPLICATION of the TECHNICAL TERMS OF THE ART of SHIP-BUILDING.

(A.) DUTCH.

DUTCH Books, whoſe principal object is an explication of the technical terms of ſhip-building, or the marine terminology in general, are not known to me. The *Dictionaire de Marine* by *Aubin* (ſee No. 6. of this Section), contains them, but only annexed to the French terms explained in it, and not in an alphabetical order, ſo that they will be uſeful only to thoſe who are familiar with the French terms, and even to theſe not without difficulty. To the Dutch tranſlation of *Bourdé de Villehuet Manœuvrier* (ſee Sect. II. No. 24.), and the books No. 6. and 7. Sect. III. contain, by way of appendixes, explications of ſome of theſe terms arranged in an alphabetical order.

(B.) ENGLISH.

1. *The Seaman's Dictionary; or, An Expoſition and Demonſtration of all the Parts belonging to a Ship: together with an Explanation of all the Terms and Phraſes uſed in the Practice of Navigation, compoſed by that able and experienced Seaman* SIR HENRY MANWAYRING, *Knight, and by him preſented to the late High Admiral of England. London: Printed by Godbid, for B. Hurlock, Anno Domini* 1670. 132 *Pages* 4*to*.

As we are at preſent furniſhed with more complete books of the ſame kind, it is only a curioſity for collections, and ſerves more to explain the derivation of the terms by the old Engliſh orthography than for practical uſe, and is in that manner more uſeful to the linguiſt and the grammarian than to practical men.

2. *A Naval Expoſitor: ſhewing and explaining the Words and Terms of Art belonging to the Parts, Qualities, and Proportions of Building, Rigging, Furniſhing, and Fitting a Ship for Sea: alſo, all Species that are received into the Magazines, and on what Services they are uſed and iſſued. Together with the Titles of all inferior Officers belonging to a Ship, with an Abridgment of their reſpective Duties. By* THOMAS RILEY BLANKLEY. *The Second Edition. London: Printed for F. W. Meadows and R. Willock,* 1755. 191 *Pages* 4*to*. 1*l*. 1*s*.

The year of the firſt edition is unknown to me. The book is printed in an elegant and ſplendid manner, and diſtinguiſhed in its external form from others of the ſame kind by a great many engravings, which take about one quarter of the breadth of almoſt every page where are the terms; and if their explanation is illuſtrated by a figure, the figure too is engraved, which cauſes many of the laſt to be very ſmall. It is not very complete; but the explanations given in it are generally ſhort, clear, true, and for the greateſt part ſatisfactory.

3. *An Univerſal Dictionary of the Marine; or, A Copious Explanation of the Technical Terms and Phraſes employed in the Conſtruction, Furniture, Machinery, Movements, and Military Operations of a Ship. Illuſtrated with Variety of Original Deſigns of Shipping in different Situations: together with ſeparate Views of their Maſts, Sails, Yards, and Rigging. To which is annexed, a Tranſlation of the French Sea Terms and Phraſes; collected from the Works of Meſſ. Du Hamel, Aubin, Saverien, &c. By* WILLIAM FALCONER, *Author of* The Shipwreck. *London: Printed for T. Cadell,* 1769. 4*to*. 1*l*. 4*s*.

The beſt and completeſt Engliſh book of this kind, though it is not quite complete; but it may be rendered ſo without great trouble, if a new edition of it is truſted to a man of ſufficient knowledge, as he finds ſo much good work done before him; and then it is to be wiſhed that ſome paſſionate ſallies of the author againſt the French navy may be omitted. The author of the next following book ſeems not to be very content with Mr. Falconer's explanations of the French ſea-terms, and explains many of them in another manner.

4. *Vocabulaire des Termes de Marine Anglois et Francois, en deux Parties, orné des Planches; avec une Explication des Figures qui y ſont contenues, et des Definitions de quelques Termes de Marine, principalement ceux de Greement. A Paris de l'Impr. Roy.* 1777. 4*to*. Part I. xxii Pages Preface, 88 Pages the Engliſh Dictionary, 4 Plates. Part II. 152 Pages the French Dictionary; from Page 153—287 the Explication of the xxvii Plates of the Second Part.

The beſt and moſt complete dictionary (containing only the explication of terms) of both languages. The author, Mr. LESCALLIER, did not collect it only from other books, but completed it by his own experience during ſeveral voyages he made with Engliſh ſhips for the particular purpoſe of collecting the Engliſh terms; and he has been, beſides this, favoured with the particular and very condeſcending aſſiſtance of Engliſhmen of rank and knowledge, which he acknowledges moſt thankfully.

5. *The Seaman's Manual; or, Dictionary of Terms.* *12mo.* 3*s.* 6*d.*

This I know only by an information of its exiſtence, which I found in the Univerſal Magazine for October 1778, page 123.

(C.) FRENCH.

6. *Dictionaire de Marine, par M. Deſroches.* 1 *Vol.* 8*vo.*

I know it by the mention of M. Saverien, who made uſe of it in collecting his Dictionary (ſee No. 8. following). It is moſt probably an old book of the laſt century.

7. *Dictionaire de Marine, contenant les Termes de la Navigation et de l'Architecture Navale; avec les Regles et Proportions qui doivent y être obſervées. Ouvrage enrichi de Figures repreſentant divers Vaiſſeaux les Principales Piéces ſervant à leur Conſtruction, les differens Pavillions des Nations, les Inſtrumens de Mathematique, Outils de Charpenterie et Menuiſerie concernant la Fabrique; avec les diverſes Fonctions des Officiers. A Amſterdam, chef Pierre Brunel,* 1702. *Avec Privil.* 767 Pages 4to. Copper-plates and wooden Cuts.

The author ſigns his name at the bottom of the dedication **AUBIN**. It is tolerably complete, and contains the Dutch terms of the art added to the French, but not arranged in an alphabetical order, ſo that all the Dutch terms muſt be wanting that have no French ſynonymes. There are to be found in it many particulars relating to the co-ordination and the management of the Dutch navy by the particular Admiralties of each of the United Provinces.

8. *Petit Dictionaire Hiſtorique, Theorique et Practique de Marine, où l'on traite de a Marine, ancienne et moderne, et où l'on donne l'Explication de toutes les Termes de cet Art; avec les Méthodes des plus habiles Marins, ſoit pour la Conſtruction des Vaiſſeaux, ſoit pour leurs differentes Manœuvres et Evolutions Navales, par* M. SAVERIEN. *Edit. nouv. corr. et augm. Tome* I. 434 Pages. *Tome* II. 286 Pages. 8vo. *Paris chez Ant. Jombert,* 1758. *avec Approb. et Priv. du Roi.*

Former editions are unknown to me. Mr. Jombert jun. announced, I believe, in the year 1781 a new one; I do not know if it came out. This book has been a long time the beſt enchiridion of this kind, and may ſtill for thoſe that cannot do better be of good uſe. It is accounted for one of its particular preferences above others, that it contains the terms which have been in uſe with the former French galleys.

9. ROLAND DE VIRLOYS *Dictionaire d'Architecture Civile, Militaire, et Navale, antique ancienne et moderne, et de tous les Arts et Metiers qui en depéndent, dont tous les Termes ſont exprimés en Francois, Latin, Italien, Eſpagnol, Allemand, et Anglois. Enrichi de* 101 *Planches de Figg. en taille douce.* 3 Vol. 4to. Paris, 1770. 70 Livres.

I know only the title of this book, which muſt be very valuable if the contents are adequate to its promiſes. It is the ſame caſe with the following.

Manuel du Marins, ou Explications des Termes de la Marine, par M. Bourde. Or'lient, 1773. 8vo.

The author of this work is known as one of the *Redacteurs* of the French *Encyclopédie Marine*; and this gives at leaſt a good prejudice for the worth of this *Manuel.*

For other books containing the explication of the French ſea-terms, ſee No. 3. *Falconer*; No. 4, *Leſcallier*; No. 12, *De Souza Sarmento*; and the annotation at the end of this Section; No. 13. of the Second, and No. 15, of the Third Section.

(D.) GERMAN.

10. *Der geoffnete Seehafen worinnen nicht allein der meiſten Nationen und Regenten, imgleichen furnehmer See-und Handelsſtadte in allen Theilen der Welt gewohnliche Schiff-Flaggen und andere Seeſeichen, ſondern auch alle auſſerliche und innerliche Theile eines Vollcommenen Schiffes, nebſt vilen Merkwurdigkeiten, ſowohl in neuer deutlicher Beſchreibung als xeirlichen Kupfer-Figuren anmuthig zu erblicken. Hamburg bey B. Schillern,* 1702. 176 Pages 12mo. and by exception of the Colours, v. Copper-plates.

This is the firſt part of a little book which belongs to this Collection, containing the firſt explication of German ſea-terms. The ſecond part contains an abridgment of the art of Navigation, whoſe title-page begins with the words *Fortſetzung des geofneten Seehafens*, and has no relation to the preſent purpoſe; therefore the paper ſhall not be waſted by a copy of the title-page. Both theſe little books make part of a whole ſuite of little books, containing a brief explanation of what in the beginning of this century was called in Germany *Gallant Knowledge.* The tranſlation abridged titles of ſome of them is, *The new-opened Academy of Architecture*; *the N. O. Arſenal*; *the N. O. Warehouſe for Furniture and Machinery*; *the N. O. Tilt-place,* &c. &c.

11. *Erlauterungen zum Verſtande der Schiffahrt und des Seekrieges nach alphabetiſcher ordnung, durch der Herausgeber der Kriegſbibliothek geſammelt. Breſlau bey Korn,* 1774, 8vo. xl. Pages Preface, 560 Pages 8vo.

That the author of this book was an entire ſtranger to almoſt all maritime knowledge, may be proved by almoſt every ſingle page of the book. The author of it is renowned in Germany for real ſervices he did to the art of war by land, and all its particular branches, by his other works *.

* The Author of this Eſſay has, ſince his firſt applications to naval arts and ſciences, begun collections of the Engliſh, French, Dutch, and German ſea-terms, arranged in an alphabetical order for his own uſe, and continued it whenever he met with any thing not contained in his collections. Theſe will be given out by a particular ſupport of the *Society for the Encouragement of Arts and uſeful Knowledge eſtabliſhed at Hamburgh*, on ſubſcription. As the book is deſtined for Germany, the explanations of the matter itſelf will be given in German, and the explications of the terms of the foreign languages by recurrences to the German explanations. This is the outline of the ſketch of the work. To judge how far the author will be able to finiſh the plan in a ſatisfactory manner is not for him to decide; he muſt leave that to the judgment of others.

(E.) PORTUGUESE.

(E.) PORTUGUESE.

12. *Elementos de Conſtrucçao e Diccionario Francez e Portuguez de todas as peſſas de que ſe formao os Navios. Que dedicou ao Illm. e Exm. Senhor D. Pedro Joſeph de Noronha Marques e Senhor das Villas Angeja, &c. Do Conſelho de S. M. Fid. e do da Guerra, &c. Capitao General da Armada Real Inſpector Geral da Marina, &c.* PEDRO DE MARIZ DE SOUZA SARMENTO. *Fid. Cav. da C. R. Capt. de Mar. e Guerra, e Adjudante de Ordens. Liſboa na Off. de Fr. L. Ameno,* 1788. *Com licença da Real Meza da Commiſſ. Geral ſobre o Exame e Cenſura de Livres.* 12 Pages Dedication and Preface, 107 Pages 8vo.

Neither the French nor the Portugueſe terms are full or complete, and the collection of the laſt may be completed by itſelf. As I doubt whether any remarkable works relating to naval architecture are written in the Portugueſe language, it will be only uſeful for foreigners trading to Liſbon or Oporto to explain themſelves, and to inform the natives of that country, as many of theſe terms cannot be found in moſt of the Portugueſe Dictionaries.

(F.) SPANISH.

Beſides the Spaniſh ſea-terms which may be contained in No. 9. of this Section, I know no particular explanations of them.

(G.) SWEDISH.

13. I know only two explications of the Swediſh ſea-terms, contained both by way of appendixes in other books. The firſt is,

Swenſk Sjo och Handels-Regiſter: A Table of the Swediſh Terms of Trade and Navigation.

It is contained in a Swediſh Dictionary, whoſe title-page follows: *Dictionarium Suethico-Anglo-Latinum quo ſingulæ voces Suethicæ ſecundum propr. et metaph. Significatt. Anglice et Latine redduntur, et phraſes magis uſitatæ, communia utriuſque gentis proverbia, locutt. vulg. nonnumq. etiam Vocabb. obſoleta exhibentur, ut harum lingg. indigeni et cognat. haut ita pridem tentata ſua paretur auctoritas. Adjecto indice Termm. in Mercatura et Re Navali. Coll. dig. et publ. jur. f.* JACOBUS SERENIUS *P. et P. Nyc. Reg. Soc. Angl. Membr. Cum grat. et priv. S. R. M. decennali. Stockholmiæ in Typogr. Reg. apud Dir. Pet. Moma,* 1761. 4to. 282 pages. The above-mentioned index begins page 276, and ſeems not to be very complete.

The ſecond is contained in Mr. *Norberg*'s Tranſlation of Mr. *Vial du Clairbois*' Annotations on Admiral *Chapman*'s Treatiſe on Ship-building. See No. 16. of the Second Section.

REMARK.

Many other writings contain ſingle explications of ſea-terms. There are to be found ſuch, *e. g.* of the French, in *Mr. Ozanam's Dictionaire de Mathematique*, and in the third volume of the *Arts de l'Homme d'Epée*; of the German, in *Hubner's et Hederich's Zeitungs Lexicis, Eggers Kriegſlexicon, &c. &c.*

SECTION II.

WRITINGS

RELATING TO THE

THEORY of the ART of SHIP-BUILDING.

1. THE Rev. Father Ignacius Gaston Pardies, of the Society of Jeſus, was the firſt who endeavoured to calculate the reſiſtance a ſhip has to ſurmount in the water wherein it moves, and to make an application of the laws of the moving forces on ſhips, in his *Oeuvres de Mathematique, contenant les Elemens de Geometrie, Diſcours du Mouvement local, la Statique, et deux Machines propres à faire les Quadrans* (the firſt edition of which was publiſhed in the year 1673). In the third Treatiſe, *La Statique, ou la Theorie des Forces mouvantes, par le Rev. Pere* Ignace Gaston Pardies, §. 1. the following pieces are belonging to this ſubject: Cap. cxv. page 238. *Application des Regles de Mechanique au Mouvement d'un Vaiſſeau*; Cap. cxvi. page 240. *Demonſtration du Chemin d'un Vaiſſeau pouſſé, par un Vent de Coté*; and Cap. cxvii. page 242. *Autre Demonſtration de ce Chemin* (the pages are numbered after the fourth edition, *A la Haye chez A. Moetjens*, 1710, 8*vo*.). The principles whereon he proceeds in his demonſtrations are, The reſiſtance of planes moving in fluids is proportional to the velocity of their motion in the fluids, and to the ſquare of the ſinus of the angle of incidence by which the fluid meets with the plane.

2. The Chevalier Renau (others write his name *Renaud*) framed on theſe ſuppoſitions a further expoſition of this doctrine, and publiſhed in the year 1689 his *Theorie de la Manœuvre des Vaiſſeaux. Paris, chez E. Michallet, Imprimeur du Roy, et de l'Exprés Commandement de ſa Majeſté.* 6 pages preface, 117 pages 8vo.

3. Christian Huygens was the firſt that declared himſelf againſt this theory in the *Bibliotheque Univerſelle et Hiſtorique (Amſterdam, chez A. Wolfgang), de l'Année* 1693. *tome* xxv. *Premiere Partie, Mois de Septembre*, pag. 105—203. He pronounced, that even by proceeding upon the ſame principles, the velocity of the motion of ſhips ought to be conſiderably greater than that eſtabliſhed by the *Chev. Renau*; and that the angles of the ſails with the direction of the wind, given by the *Chev. Renau* for the moſt advantageous to the velocity of the ſhip, wanted a conſiderable alteration.

4. Probably the *Chev. Renau* himſelf (being at that time *Ingenieur General de la Marine* in France) cauſed theſe objections againſt his theory to be reprinted, and inſerted in the *Journal des Sçavans pour l'Année* 1693, *Lundy le* 9. *May*, page 310, under the following title: *Remarque de Mr. Huygens ſur le Livre de la Manœuvre des Vaiſſeaux, Imprimé à Paris in* 8*vo*. 1689; and gave in the two next following numbers of the ſaid *Journal, Lundy le* 16. *May*, page 329, and *Lundy le* 23. *May*, page 335, a refutation of Mr.

Huygens' objections, founded on the inconteſtible doctrine of the decompoſition of the moving forces. Mr. *Huygens* did not anſwer to this in a ſaisfactory manner; the diſpute ſeemed to be finiſhed; and the *Chev. Renau* fancied the victory to be on his ſide. There probably have been preceding his ſeemingly laſt deciſion ſome declarations *pro et con* on both ſides, but they are unknown to me, as well as Mr. *Huygens'* anſwer, which did not give full ſatisfaction.

5. Very unexpectedly there aroſe another opponent of the Chevalier *Renau*. Mr. *James Bernoulli* (Profeſſor of Mathematics at Groeningen) inſerted in the *Acta Eruditorum* of the month of July of the year 1696, page 282, a Memoir under the following title:

JACOB BERNOULLI *Problema Beaunianum univerſalius conceptum, &c. cum liis quibuſdam Annotationibus.*

In this memoir he juſtified Mr. *Huygens'* objections againſt the theory of the *Chev. Renau*; and differed from both his predeceſſors therein, that he ſtated the proportion of the velocity of the wind to that of the ſhip definite, which had been ſuppoſed by them as indefinite or indeterminated.

6. The *Chev. Renau* replied to this new juſtification of the objections made againſt his theory in another Treatiſe, the title of which is as follows:

Memoire, où eſt demontré un Principe de la Mechanique des Ligneurs dont on c'eſt ſervi dans la Theorie de la Manœuvre des Vaiſſeaux, et qui a été conteſté par Mr. Huygens;

(the form and the year of the publication of this Treatiſe are unknown to me) wherein he is reported to have reſtrained himſelf only on reiterated demonſtrations of his principles relating to the decompoſition of the moving forces, without giving a formal refutation of the objections of Mr. *Huygens*.

7. Mr. *John Bernoulli* (Profeſſor at Baſle, and brother to the afore-mentioned *James Bernoulli*) at firſt declared himſelf favourable to the theory of the *Chevalier Renau*; but after further enquiries he recanted this declaration, and accounted for it in the following book, which he offered before its publication to the *Academie des Sciences* at *Paris* for further examination:

Eſſay d'une nouvelle Theorie de l Manœuvre des Vaiſſeaux, avec quelques Lettres ſur le même Sujet, par J. BERNOULLI, *Prof. de Math. et Membre des Acc. Roy. des Scienc. de France, d'Angleterre, & de Pruſſe. A Baſle, chez G. Koenig,* 1714. 14 pages Preface, 220 pages 8vo. (The Letters annexed are three; two of Mr. Bernoulli to the Chev. Renau, and one from the laſt-mentioned to the former.)

By aid of his moſt intimate familiarity with the ſublimeſt mathematics, Mr. John Bernoulli had penetrated the matter much deeper than any of his predeceſſors, inſomuch that the diſpute was declared to be at an end in favour of Mr. *Huygens*. But as Mr. *John Bernoulli* would not allow the proportion of the velocity of the wind to the velocity of the ſhip as definite, but ſuppoſed it in all its calculations as indefinite, his determinations of the velocity of ſhips could not come ſo nigh the truth as that given by his brother *James*. He found the very ſame determination for the angle of the ſails with the direction of the wind given by Mr. *Huygens*, and accuſed the latter to have concealed the manner in which he had found it. He joined to theſe inquiries another of the moſt advantageous angle of the ſails with the keel, and by uniting the ſolutions of both problems, he derived therefrom a determination of the moſt advantageous angle of the ſails with the direction of the wind and that of the keel with as much ſkill as ingenuity. But as, unhappily, all his concluſions were founded on the indefinite proportion of the velocity of the wind to that of the ſhip, and having not taken into conſideration the influence of the lee-way, the reſults of all his moſt ingenious calculations were deſtitute of true application; and it will be always a valuable loſs to the art that Mr. Bernoulli had no practical knowledge at all of naval affairs. The *Chev. Renau* could not convince himſelf that his theory had been duly refuted; he came out again, and Mr. Bernoulli had no other remedy to make him ſatisfied than a declaration, that the decompoſition of the moving forces was ſubject in fluids to laws quite different from thoſe demonſtrated for ſolids. After this declaration the *Chevalier* gave up the diſpute, but ſeemingly more from motives dictated by prudence, modeſty, and ſenſe of ſuperiority of his opponents, than from true conviction.

8. This elegant theory of Mr. *Bernoulli* did not afford any real utility to the art, as it was for the above-mentioned reaſons in no manner applicable. The only literary production that appeared afterwards, founded on the very ſame principles, is,

La Theorie de la Manœuvre du Vaiſſeaux reduite en pratique, ou les Principes et Regles pour naviguer le plus avantageuſement qu'il eſt poſſible, par M. PITOT, *de l'Acad. Roy. des Scienc. A Paris, chez C. Jombert,* 1731. *Avec Approbat. et Privil. du Roy.*

But it has been of no real uſe, as the author, beſides the theoretical errors contained in it, had not the ſlighteſt practical knowledge of nautical things, and ſuppoſes many things as facts which perhaps are never thought of by practical ſeamen.

9. The relation by which the above-mentioned ſeries of writings is connected to each other has cauſed the omiſſion of another remarkable work, which in ſtrict chronological order ſhould have been produced ſomewhat earlier, and is now mentioned here; it is

Theorie de la Conſtruction des Vaiſſeaux qui contient pluſieurs Traites de Mathematique ſur des Matiéres nouvelles et curieuſes par le Pére PAUL HOSTE, *de la Comp. de Jeſus, Prof. de Math. dans le Seminaire Royal de Toulon. A Lyon, chez Aniſſon et Poſuel,* 1697. *Avec Privil. du Roy.* 5 pages Preface, 172 pages folio.

It is inſerted in another very well known book, whoſe title is, *L'Art des Armées Navales, ou Traité des Evolutions qui contient des Regles utiles aux Officiers Generaux et particuliers d'une Armée Navale, avec des Exemples tirez de ce qui c'eſt paſſé le plus conſiderable ſur la Mer depuis cinquante Ans* (year, form, and bookſeller like the former). This Treatiſe is very remarkable, as the author, in his calculations of the reſiſtance in the water, proceeds upon quite different principles, viz. that the quantity of the reſiſtance of planes is proportional to the ſingle velocity of their motion; and for planes that are oppoſed in oblique angles to the direction of a current, as the ſingle ſines of the ſaid angles by which the current encounters them. Theſe principles are the more remarkable, as the neweſt and moſt anſwering theories to experiences adopt the very ſame; though they were almoſt univerſally rejected by the cunning, deriving all their enquiries from the principal proportions of theſe reſiſtances mentioned by occaſion of the theory of the *Chev. Renau.* The reaſons why the concluſions *Father Hoſte* derived from theſe principles were ſo little conformable to what reſults from experience are other mechanical principles not truly applied, and cannot be imputed to the ſaid proportions of reſiſtance given by him.

10. After a long ſilence on this matter, the Memoire of Mr. Bouguer, to which has been adjudged the premium of the French Academy of Sciences,

De la Mâture des Vaiſſeaux, Piéce qui a remporté le Prix de l'Acad. Roy. de Scien. propoſé pour l'Année 1727, *ſelon la Fondation faite par feu M. Rouillé de Meſlay, &c. A Paris, chez C. Jombert,* 1727. 164 pages 4to. 5 plates,

ſeems to have been again the firſt to be mentioned here. It is inſerted in the *Receuil des Piéces qui ont remporté le Prix de l'Academie Royale des Sciences, depuis leur Fondation juſqu' à préſent. Avec quelques Piecés qui ont été compoſées a l'Occaſion de ces Prix. Tome premier, qui contient les Pieces depuis* 1720, *juſqu'en* 1725. This renowned and afterwards ſo-much-eſteemed author of very valuable nautical treatiſes gives therein, with a conſiderable expence of penetration of ſublime mathematics, rules that are not at all applicable to practice, with exception only of the caſe when a ſhip runs right before a wind, and the which Mr. Bouguer himſelf declares were inapplicable for ſhips ſailing cloſe hauled, and even with the wind on the beam.

11. In the *Treatiſe on Fluxions, by Colin Mac Laurin. A. M. Prof. Math. in the Univerſ. of Edinburgh, F. R. S. 2 tom. 4to.* publiſhed at Edinburgh in the year 1742, there is to be found near the end of the ſecond volume, ſect. 202, a ſolution of the problem of the *Determination of the Angle of the Yards with the Direction of the Wind and the Bearing of the Keel, moſt advantageous to the Velocity of a Ship.* But in this ſolution of the problem of that learned author, it is to be much complained of him, as well as of others, that he ſuppoſes the velocity of the wind in proportion to that of the ſhip as infinite, and does not make the due allowance for the lee way. Without this, the art very probably would have been indebted to him for the true ſolution of the problem.

12. All that had been treated hitherto in writings of the theory of ſhip-building were ſingle objects, and ſolutions of detached problems. They wanted to be collected to be connected by themſelves, and others that till their time had not been conſidered at all, and to be arranged into a complete ſyſtem, to ſeparate the clear profit for the ſcience from the imaginary and from vain inquiries. This was done by Mr. *Bouguer* in his

Traité du Navire, de ſa Conſtruction et de ſes Mouvements, par M. Bouguer, *&c. A Paris, chez Guerin et De la Tour,* 1747. *Avec Approb. et Privil. du Roy. 4to.*

The great extent of the number of objects conſidered in this work, the moſt conciſe, accurate, and elegant performances of the inveſtigations of every pertinent object, accompanied with an eaſineſs and perſpicuity of their explanations, and a moſt happy application of the ſublimeſt geometry, by which the author of it renders the intelligence of the moſt difficult problems eaſy to almoſt every capacity, even of ſuch as are not acquainted with ſublime mathematics, make this book a truly claſſical work, and acquired to its author a very extended and moſt deſerved fame. But even with him it is to be complained of, that the practical knowledge of nautical affairs, which he had opportunity to acquire during ſeveral long voyages made by order of the French Academy of Sciences for other ſcientifical purpoſes, were not quite ſufficient to make an entirely pertinent application of his theoretic intuition to the very objects. Yet the art of ſhipbuilding is very much indebted to him, and his explanations in particular of every thing relating to the equilibrium of ſhips, and the ſituation of the different centers of gravity, and every matter depending thereon; ſo that it will remain always a capital book, and inſure the fame due to his memory. An Engliſh abridgement of this book ſee No. 13, of the Third Section.

13. *Scientia Navalis, ſeu Tractatus de conſtruendis et dirigendis Navibus. Pars prior, complectens Theoriam univerſam de ſitu ac motu corporum aquæ innatantium. Auctore* LEONHARDO EULERO, *Prof. non Acad. Imper. ſoient et Direct. Acad. Reg. ſoient Boraſſ. Inſtar Supplementi ad Tomum* 1. *novorum Commentariorum Acad. Scien. Imper. Petropoli, Typis Acad. Scientiar.* 1749.

Pars Poſterior; in quâ Rationes ac Præcepta Navium conſtruendarum ac gubernandarum fuſius exponuntur.

Mr. *Euler*'s merits in every part of ſcience he made an object of his meditations are notorious, and give foundation to an advantageous prejudice, that even in this matter he could not forward any thing to be called mediocre. Indeed he has done every thing, and one would be induced to ſay more than reaſonably could be expected from his want of practical nautical knowledge. His particular manner of treating theſe objects, and his ſolutions of the theoretical problems of the art of ſhip-building, will ſerve for ever as patterns, and afford always a very ſolid foundation whereon his ſucceſſors may erect their edifices, and even have erected them already. Though the author ſuppoſes his work, for ſake of the familiarity with the ſublimer mathematics, will be only uſeful to ſuch as have paſſed (if I have leave to ſay ſo) the firſt degrees of the myſteries of higher mathematics, yet it will be found acceſſible to every man of ſenſe. That his enquiries ſhould not be entirely inacceſſible to thoſe verſed only in the elements of mathematics, he cauſed an edition of the moſt uſeful doctrines of his greater work to be publiſhed in a ſmaller treatiſe, more adapted to the common capacity of the navigator, the original of which is in French, but has been tranſlated into the Ruſſian, the Italian, and the Engliſh languages.

14. The title of his ſmaller work is,

Theorie complette de la Conſtruction et de la Manœuvre des Vaiſſeaux miſe à la portée de ceux qui s'appliquent à la Navigation, par M. LEONARD EULER. *A Paris, chez C. A. Jombert,* 1776. *Avec Approb. et Privil. du Roi.* 268 pages, 8vo. (5 French livres.)

This is not the title of the original edition that came out at Peterſburgh in the year 1773; but this ſecond edition was made with conſent of the author: the French ſtile in it is ſomewhat more correct; and there are ſubjoined two ſhort Appendixes by Mr. *Lexell* to it, which contain a determination of the difference of the bearing of a ſhip cloſe-hauled, and the direction of the force by which it is moved.

The Engliſh tranſlation has the following title:

A Complete Theory of the Conſtruction and Properties of Veſſels, with practical Concluſions for the Management of Ships, made eaſy to Navigators. Tranſlated from Theorie complette de la Conſtr. et de la Man. d. V. of the celebrated Leonard Euler, by HENRY WATSON, *Eſquire. London: Printed for J. Sewell, Cornhill,* 1776, 8vo. *New Edition, with the Life of the Tranſlator. London: Printed for the ſame.* 181 pages 8vo. 1790. 6s.

The tranſlator was late Colonel and Chief Engineer of the Hon. Eaſt-India Company in Bengal, and a very ſucceſsful practical ſhip-builder. The tranſlation is made after the firſt edition of the original, without the Appendix of Mr. *Lexell*, and remarkable for its fidelity.

15. The neweſt and moſt complete ſyſtematical work on the theory of ſhip building is,

Examen Maritime theorique et practique, ou Traité de Mechanique appliqué à la Conſtruction et à Manœuvre des Vaiſſeaux et autres Batimens, par Don GEORGE JUAN, *Commandeur d'Aliage dans l'Ordre de Malthe, la Chef d'Eſcadre des Armées Navales de ſa Maj. Cathol. Commandant du Gardes de ſa Marine, de la Soc. Roy. de Londres, de l'Acad. Roy. de Berlin, et Correſp. de l'Acad. Roy. des Scienc. de Paris. Traduit de l'Eſpagnol, avec des Additions par M* LEVEQUE. *Ing. Hydrogr. de la Marine, Correſp. de l'Acad. Roy. de la Marine, et du Muſée de Paris, Prof. Roy. en Hydrographie et Mathematiques a Nantes.*

Qui deſcendunt mare in Navibus, facientes operationem in aquis multis, ipſi viderunt opera Domini, et mirabilia in profundo. Pſalm. 106.

Tome premier xii pages Preface of the Tranſlator and approbation, 396 pages, and 14 pages the Regiſter, 5 copper-plates, 4to.

Tome ſecond, 364 pages and 20 pages the Regiſter, 9 copper-plates. *A Nantes, chez l'Auteur (Traducteur) à J. Malaſſis et Deſpilly*, 1783.

The original is written in Spaniſh; I never had an opportunity to ſee it. It was firſt publiſhed in the year 1771, and contains a great quantity of ſuch ſatisfactory enquiries as could be expected from the very rare aſſociation of a more than common familiarity in ſublime mathematics, with very extenſive, ingenious, and penetrating practical knowledge. The mention only of the circumſtance, that the author ſerved on board the ſame ſhip wherein Mr. *Bouguer* made, in the year 1735, his paſſage to Spaniſh America for the menſuration of the degree of latitude under the Line, propoſed by the French Academy, will produce a favourable prejudice that his work, publiſhed in the year 1771, contains neither the mere ſpeculations of a theoriſt, nor the premature favourite ſyſtem of a mere practical man; but on the contrary, the reſults of many judicious experiences compared to theory by a moſt ſkilful application of profound erudition: and if it could be proved that the author conceived already at that time the idea of his ſyſtem, perhaps cauſed by his acquaintance with Mr. *Bouguer*, he would have prolonged the *Horatian* "*nonum prematur in annum*" almoſt to the ninth *Luſtrum*; a time that ſurpaſſes perhaps the whole duration of many a modern philoſophic ſyſtem. Perfectly well acquainted with every thing done by his predeceſſors for the ſucceſs of the art of ſhip-building, and every other uſeful art nearer or farther related to it, he compared and examined the reſults of their ſtudies with his own and fair experiences, which made him able to form a quite new ſyſtem, whoſe nice accord with his own experience and the experiences of others, made without any knowledge or relation to his ſyſtem, ſcarcely leaves any wiſh for farther perfection. His new theory of the reſiſtance of fluids, derived from the conſideration of the force that would be required to ſtop the running out of a fluid contained in a veſſel through a hole made in that veſſel below the ſurface of the fluid, joined to his very ingenious and deciſive experiments of the reſiſtance ſuffered by bodies moving in fluids, prove the truth of the old principles given by the *Rev. Father Hoſte*, and elevate *Don Juan*'s farther explanations of that theory to the moſt ſatisfactory ever given till the preſent. This teſtimony is particularly due to the conſideration of many particular circumſtances hitherto almoſt entirely neglected, or at leaſt not duly conſidered, viz. that planes moving in fluids muſt ſuffer a much greater reſiſtance below the ſurface of the fluid than near it, increaſing in proportion to the depth of the immerſion of every particular part; and of the particular phænomena that are to be conſidered, if the body moving in fluids is partly immerged and partly elevated above the ſurface of them, and others depending from the velocity of the movement of the floating bodies, &c. The moſt ingenious author, who reflects ſo much honour on the ſervice wherein he is a veteran, not content with theſe theoretical enquiries, enlarges them at the ſame time on many matters that are in ſome manner related to the art of ſhip-building, and does this commonly with a very modeſt compariſon of his own reſults with the reſults of others about the ſame matter. If there is any difference between theſe reſults, he endeavours to diſcover the reaſons of it, and does full juſtice to every one who contributed ſomething to the perfection of the art. To all this there are added, in the fifth book, practical rules founded on the explained theories, and ſhewing their juſt application by their perfect conſent to what many other practical able ſeamen found at laſt, certainly by a much more dangerous and more tedious way, the experience of a long ſeries of years. The remarks of the tranſlator (whoſe verſion, as far as may be judged without compariſon of the original, ſeems to be a very good one) in general point out errors in the calculations, or conſiderations on the influence of quantities neglected in them, &c. In principal things they make no alterations. The ſenſe of ſome ſingle Spaniſh or French technical terms ſeems to have been unknown to him, as he ſometimes tranſlates by paraphraſes where he could have uſed ſynonymous French ſea-terms.

16. Another moſt valuable work of an equally ſkilful, ingenious, able, and experienced ſeaman (having the particular merit of illuſtrating the conſtruction of merchant and private ſhips of almoſt every kind and denomination uſed in Europe) entirely neglected, with the exception of ſome Engliſh and Dutch practical authors who illuſtrate the building of merchantmen by moſt of the authors that wrote on the art of ſhip-building, is known to me only by two French tranſlations. The firſt has the following title:

Traité de la Conſtruction des Vaiſſeaux, avec une Explication où l'on démontre les Principes de l'Architecture Navale Marchande, et des Navires Armés en courſe. Par M. Frederic de Chapman, *Chev. de l'Ordre du Roy de Suede, Directeur General des Conſtructions et des Flottes Navales du Royaume, Membre de la Societé Roy. et Acad. des Sciences de Stockholm. Traduit du Suedois ſur l'Edition publiée et imprimée chez Jean Pleiffer en* 1779. *Avec Approb. et Priv. du Roy.* viii pages Preface, 169 pages and 11 copper-plates, Fol. Maj.

This tranſlation is only noticed to warn againſt it, being made by a man of undoubtedly ſufficient theoretical mathematical knowledge for the tranſlation, but without any acquaintance with the art of ſhip-building, the technical terms of the original, or the language into which he tranſlated, and conſequently almoſt unintelligible. It would require a particular ſtudy, and a great familiarity with the Swediſh technical terms, to underſtand it, as moſt of them are tranſlated *verbatim*, and very often, by evident miſtake, quite wrong. In other reſpects this tranſlation renders the original unaltered (as far as that may be ſaid in relation to the above remarks); that is, without any omiſſion. A conſiderable part of this tranſlation refers to drawings contained in the *Atlas for Ship-Building*, which will be mentioned No. 14. Sect. III.

Traite de la Conſtruction des Vaiſſeaux; avec Eclairciſſemens et Demonſtrations touchant l'Ouvrage intitule ARCHITECTURA NAVALIS MERCATORIA, &c. PAR FREDERIC HENRI CHAPMANN, *Chev de l'Ordre R. de l'Epee, Premier Conſtructeur des Armees Navales, et de l'Acad. Roy. de Stockholm. Traduit du Suedois Publie avec quelques Notes et Additions pour rendre la lecture independante du grand Ouvrage en Planches du même Auteur* ARCHITECTURA, *&c. mentionne ci-deſſus, par* M. VIAL DU CLAIRBOIS, *Sous-Ingenieur-Conſtructeur et de l'Acad. Roy. de la Marine. A Breſt, chez R. Malaſſis. A Paris, chez Durand neveu, et Jombert jeune* 1781. *Avec Approb. et Priv. du Roi.* xxiv Pages Prefaces and Dedication, 146 Pages 4to.

Such is the title of the ſecond tranſlation, beyond compariſon ſuperior to the former, and made by one of the moſt intelligent and judicious theoretical and practical Ship-builders of the French navy, with the aſſiſtance of the celebrated *M. de Löwenörn*, ſerving at the time of the tranſlation as a volunteer in the French navy, at preſent Captain in the Daniſh navy and Adjutant-General, and known in the literary world as author of a voyage made to try time-keepers of Daniſh workmanſhip, and Director of the Archive for Sea-Charts for the Uſe of the Daniſh Navy. This tranſlation is accompanied with many very good and judicious notes and applications to the French navy, and made quite independant of the uſe of the above-mentioned Atlas, by addition of ſome copper-plates not contained in the original. But it is to be regretted, that the judicious tranſlator omitted ſome not quite indifferent paſſages of the original. The remarks added by Mr. Vial du Clairbois are found ſo judicious, that they were tranſlated into the Swediſh tongue under the following title:

Anmarkningar vid Ofverſtens och Riddarens af Kong. Suards-Orden, Herr of Chapmann's Tractat om Skepps-Byggeriet. Forfattade pa Franſyſka af Herr Vial du Clairbois, Under-Skepps-Byggmaſtare uti Kongl. Franſyſk Tienſt; ofverſatte pa Suenſka af. M. A. NORBERG, *Byggmaſtare vid Hielmare Sluſſverk. Och huilken äfven harvid biſogat en Ord-Bok ſom innehaller Suenſk ofverſattning pa de uti detta Verk, ſa uti Skepps-Byggeriet, ſom Siomanſkapet forekommanda Franſyſka Konſt-Ord, ſamt ſadana Sio-Termer of ſamma Sprak, huilke uti Aviſor, Reſe-och Lefvernes Beſkrifningar vanligaſt forekomma. Stockholm. A. J. Nordſtrom,* 1782. 115 Pages 4to. xx. Copper-Plates.

As No. 11. of the following Series of Original Papers relating to Ship-building contains a more complete extract of the contents of Mr. Chapman's book than could be given here, it would be ſuperfluous to give at his place another. It may be ſufficient to point it out as a very capital ook, full of good theoretical and practical inſtruction.

17. *L'Art de la Marine, ou Principes et Preceptes Generaux de l'Art de Conſtruire, d'Armer, de Manoeuvrer, et de Conduire des Vaiſſeaux. Par* M. Romme, *Correſp. de l'Acad. des Scienc. de Paris et Prof. Roy. de Navigation des Eleves de la Marine. A la Rochelle, chez P. L. Chauvet,* 1787. 587 Pages 4to. vii Copper-plates.

This book contains an *epitome* of every part of maritime knowledge, arranged in a very judicious manner, to give a general view of the whole; and among theſe the moſt eſſential of the Theory and Practice of the Art of Ship-Building. It is particularly remarkable for the preſent purpoſe, for containing an account of the neweſt experiments made in France, with the (as far as I know) largeſt models or blocks uſed for this purpoſe, to ſettle ſomething by experience about the various forms of ſhips-bottoms. Theſe experiments ſeem to give the following reſult: "That the form "of the bottom, or the immerſed part of ſhips, is much more indifferent "than ever could be gueſſed; and that the moſt principal element of the "reſiſtance of a ſhip is the *immerſed part of the midſhip-bend, and its area.*" The learned author exerts all his ſkill to eſtabliſh this concluſion of his own, and the experiments of others, as an undoubted principle. Though it ſeems that the reſults of theſe experiments are not quite ſo deciſive, it cannot be denied, that the author's ſkill contributes much to its probability.

18. I mention yet here another book that by its form and contents could be claſſed under any of the Three Sections made in this Eſſay of a General View of the Literature of Ship-Building.

Encyclopedie Methodique MARINE. Dediee et preſentee à Monſeigneur le Marechal de Caſtries, Miniſtre et Secr. d'Etat au Departement de la Marine. A Paris, chez Panckouke: à Liege, chez Plomteux. Avec Approb. et Privil. d Roi. 4to.

Tome I. 1783. xvi Pages Preface and Introduction, 712 Pages.
Tome II. 1786. 783 Pages. Begins with the article *Deſtination.*
Tome III. 1786. 897 Pages. Begins with the article *Nadir.*

A whole volume of partly large copper-plates, the numbers of which begi with 1 to 156, and after theſe from i. to xvi.

This new edition of this part of the French *Encyclopedie* (calculated in general to give a general view of the preſent ſtate of human knowledge) contains extracts and abridgements of all the theoretical works enumerated in this Section of the General View of the Literature of the Art of Ship-Building, principally from No. 12. and the following; and for the practical part of this art, from the book No. 11. of the following Section, and many other original memoirs; collected, extracted, and compoſed, for the greate and moſt important part to the preſent part by M. *Vial du Clairbois*; and, conformable to the general plan of the whole *Encyclopedie*, arranged in an alphabetical order: beſide this and many valuable annotations and remarks o the abridger, will be found the moſt complete collection of the French ſea terms, commented upon and explained generally in a moſt ſatisfactory manner and among theſe are a great number of explications and memoirs of nautica affairs of every kind; and in particular relating to the ſervice in th French navy. The former render this book, to every perſon who has no the deſign to make a collection of nautical books, able to ſerve him as whole *Bibliotheque Nautique.* However, the moſt diffuſe inſertions of all th

numerou

numerous regulations and ordonnances concerning the former and more recent ſervice in the French navy (which probably will be altered again by the conſequences of the laſt French Revolution), render it much more voluminous, and conſequently much more expenſive for ſtrangers, than it would be without them; though theſe, on the contrary, make it in ſome manner the more intereſting for the French navy.

19. Some other little memoirs and larger treatiſes I mention here collectively, as I know nothing more of them than their exiſtence. They are:

1. *Eſſay d'une nouvelle Theorie de la Reſiſtance des Fluides, par M.* D'ALEMBERT. *Paris,* 1732. 2 Vol. 4to.

2. *Experiences ſur la Reſiſtance des Fluides, par M. le* CHEVALIER BORDA.

Two Memoirs of this title are inſerted; the firſt in the *Hiſtoire de l'Acad. Roy. des Sciences, Année* 1763. *Avec les Mémoires de Mathematique et Phyſique pour la même Année, tirés des Regiſtres de cette Acad. A Paris de l'Impr. Roy.* 1766, from page 358—377; the ſecond, in the *Hiſtoire de l'Acad. &c. &c. Année* 1767. *A Paris, &c.* 1770, from page 495—to 503.

3. *Memoire ſur l'Etabliſſement d'une nouvelle Theorie de la Reſiſtance des Fluides, par M.* DE MARQUERIE, *Lieut. de Vaiſſeau.*—Inſerted in the *Memoires de l'Academie Royale de la Marine à Breſt, Tome* I. 1773.

4. *Nouvelles Experiences ſur la Reſiſtance des Fluides de M. M.* D'ALEMBERT, *le Marquis* DE CONDORCET, *et l'Abbe* BOSSUT. *A Paris,* 1777. 8*vo.*

20. Another little pamphlet, the author of which ſeems to be the afterwards *Marechal de Caſtries,* merits a particular mention, for ſake of the great eulogium paſſed on it by the celebrated Admiral *Sir Charles Knowles.* I do not know the original, and only the Engliſh tranſlation made by the ſaid Admiral, the title of which is:

An Abſtract on the Motion of Floating Bodies, by M. DE LA CROIX, *Commiſſaire-General de la Marine, &c. &c. Tranſlated from the French, and publiſhed by Admiral* KNOWLES; *and now reprinted, London, for Robſon,* 1775. 53 Pages 4to. 1 Copper-plate, 15s. 6d.

The Hon. Admiral's eulogium of it, printed at the head of it, ſtates the following: "This little Treatiſe contains more knowledge in the art of "ſhip-building than any book hitherto publiſhed I have met with. "The principles the author proceeds upon are juſt and true; I have "verified them by a number of experiments, and they agree exactly "with the calculations he gives: but what proved moſt ſatisfactory to me "was, their anſwering perfectly well when put into practice in ſeveral line "of battle ſhips and frigates that I built whilſt I was in Ruſſia." Though have no mind to contradict the Hon. Admiral's opinion, declared in this ulogium, I cannot but beg leave to remark, that if a ſkilful man is able to make a much more extenſive and more profitable uſe of a leſs perfect nſtrument for the producing of maſter-pieces of any kind, the perfection of hem ſeems to me to be due more to the individual ſkill of the ſubject ing able to make *that* uſe of it, than to the inſtrument.

21. To

21. To make this Collection as complete as I am able to do, I find myſelf obliged to mention two new German writings upon the art of ſhip-building. But with every predilection for my countrymen I cannot but obſerve, that the author of them hazarded to forward a great many propoſals, among which I ſhould be very anxious to point out a ſingle one as practicable, if I was able to find it ; and the which I do not know how to claſs, if they will not be admitted in the liſt of entire miſtakes of the human underſtanding. The principal requiſite to be aſked of a man who intends to make propoſals for any meliorations, ſeems to be a juſt knowledge of the preſent ſtate of the object the meliorations are intended for ; but this author ſeems to be quite deſtitute of any idea of the form and the manner of managing ſhips deſtined for ſervice at ſea. Vouchers for this aſſertion are to be found in every part of his works, the titles of which are :

Dedale ; c'eſt à dire, Inventions nouvelles pour l'Avantage de la Navigation en general et principalement ſur Mer. Berlin, chez G. A. Lange, 1777. 4to. 3 Planches.

The Bookſeller, Mr. Lange at Berlin, printed, without the author's knowledge, a German tranſlation of it, made by the author himſelf, under the title,

Daedalus, das iſt neue Erfindungen zum Vortheil der Schiffahrt uberhaupt, haugtſachlich aber auf der See, von CHRISTIAN GOTTLIEB BERGER, *der Arzeney Wiſſenſhaft Doctor. Mil 3 Kupfertafeln. Berlin, bey G. A. Lange,* 1781. viii Pages Preface, 63 Pages 8vo.

The neweſt production of this Author, wherein he explains his inventions more amply, though I cannot but declare his former productions to be publiſhed prematurely, is,

Vorſchlage zur Vervollkomnerung der Schiffahrt. Den Seefahrenden Nationen gewidmet. Berlin, 1787, *bey S. F. Heſſe.* xlviii Pages Prefaces, &c. 293 Pages 8vo. 3 Plates.

22. The conſtruction and the management, or the working, of ſhips are ſo cloſely connected, that the beſt conſtructed ſhip will loſe all its eminent properties by aukward management; on the contrary, I dare to aſſert, that it hardly will be poſſible to conſtruct a veſſel in ſuch a manner that a good mariner ſhould be unable to amend, in ſome meaſure, its properties more or leſs, by means that are in his hand, after its being finiſhed on the ſtocks (though it may perhaps be impoſſible to fit it for a certain deſtination). This will account for the mentioning here ye ſhortly ſome few other works relating to the management of ſhips, t render this branch of literary knowledge as complete as I am able t do it.

23. M. BOUGUER regarded his *Traité du Navire* (No. 12. of this Section as a work intended properly for the uſe of the Naval Architect, an publiſhed ſome years afterwards another treatiſe deſtined properly for th mariner. The title of the laſt is :

De la Manœuvre des Vaiſſeaux, ou, Traite de Mechanique, et de Dynamiqu dans lequel on reduit à des Solutions tres ſimples les Problems de Marine les pl faciles qui ont pour Objet le Mouvement du Navire, par M. BOUGUE *de l'Acad. Roy. des Sc. de la Soc. de Londres, Honor. de l'Acad. de Marine et ci-devant Hydrographe du Roi au Port de Croiſie et au Havre de Grace. A Paris, chez Guerin et Delatour* 1757. *Avec Approb. et Priv. de Roi.* 520 Pages 4to. 16 French livres.

This work, written with the ſame eaſe and elegance as the *Traité du Navire*, is for the mariner what the laſt mentioned *Traité* is for the ſhip-builder, a complete ſyſtem of uſeful knowledge ; and remains till the preſent, in ſome meaſure, the moſt capital book of its kind.

24. Next to it follows:

Le Manœuvrier ; ou, Eſſai ſur la Theorie et la Pratique des Mouvemens du Navire, et des Evolutions navales, par M. BOURDE DE VILLEHUET, *Officier de la Compagnie des Indes. Avec Fig. en taille douce.*—Hoc opus, hic labor eſt. Virg. Æneis.—*A Paris, chez Guerin et Delatour* 1756. *Avec Approb. et Priv. du Roi.* xxvi Pages Preface, 406 Pages 8vo.

This work contains no properly new explanations, and differs in one reſpect from the treatiſe of M. Bouguer on the ſame ſubject, that after having ſtated an idea of the principles whereon depends the management of ſhips, and the inſtruments by which the action of the forces moving them are communicated to them, it ſhews the particular application of theſe principles in particular caſes. Beſide this, it contains an abridgement of ſea-tactics and ſignals, together with the particulars of the French exerciſe with the great guns, and the arranging ſhips for battle, &c. which render it very proper for the uſe of young ſea-officers. There is a Dutch tranſlation of it, under the title,

De Scheepſbeſtierder ; of Proef van Beſchouwinge aengaende de Bewegingen van het Vaertuig en de Krygſwendingen ter Fee. Vertaelt uit het Franſch van den Heer BOURDE DE VILLEHUET, *Bevelhebber van de Scheepen der Franſche Indiſche Maetſchappye. Met ropere Platen te Dordrecht by Abr. Bluſſe,* 1768. xlviii Pages Prefaces and Index, 469 Pages 8vo.

The tranſlator has been ſomewhat puzzled with the technical terms of the original ; and even thoſe of the Dutch language have not been familiar to him, as he calls many articles quite wrong. Notwithſtanding this, the explanation of the Dutch ſea-terms, annexed by way of appendix, is very good ; and though far from being complete, is a very good contribution to a collection of ſuch terms.

Much better is a new Engliſh tranſlation, containing ſeveral very judicious additions and alterations of the tactical evolutions propoſed by the author, by way of notes ; but as ſea-tactics are not pertinent to the preſent ſcope, the only mentioning of them will arouſe the attention of ſuch as have an inclination to enquire after them. The title of this tranſlation is,

The Manœuvrer ; or, Skilful Seaman : Being an Eſſay on the Theory and Practice of the various Movements of a Ship at Sea, as well as of Naval Evolutions in general. Tranſlated from the French of M. BOURDE DE VILLEHUET, *by the* CHEVALIER DE SAUSEUIL, *Knight of the M. N. Order of St. Philip, Captain of Infantry in the French Service, late Captain and Major-Adjutant of the Legion of Tonnerre, and Member of the Engliſh Society for the Encouragement of Arts, Manufactures, and Commerce. Illuſtrated with Thirteen Copper-Plates ; five of which, with many intereſting Obſervations interſperſed through the Work, by way of Notes, are the Production of an Engliſh Officer. Dedicated to* HIS ROYAL

HIGHNESS PRINCE WILLIAM HENRY. *London, Hooper*, 1788. xxviii Pages Prefaces, &c. 308 Pages 4to. (1 liv. 1 ſ.).

25. Several other books apparently belonging to this Chapter from the principal words of their titles, I can only mention, as I do not know them farther than having found them mentioned by others.

1. *Exercice general de toutes les Manœuvres qui ſe font ſur la Mer dans toutes les Occaſions qui ſe peuvent preſenter, par M. le* CHEVALIER DE TOURVILLE. Referred to by Saverien in his "Dictionaire de la Marine" (See Sect. I. No. 8.).
2. *Nouvelle Theorie de la Manœuvre de Vaiſſeaux à la Portee des Pilotes.*
3. *Pratica de la Maniobra de los Navios.*

Theſe I found in the catalogue of books for a *Bibliotheque de Marine* in the third tome of the French *Encyclopedie Marine*, mentioned at the end of the Introduction.

26. *Zaakelyk en grondig Onderwys om met een Schip van Oorlog te Manœuvreeren voor de Heeren Adelborſten op s'Lands-Schip, den Admiral General. Onder Commando van den Hoogedelgeſt. Heer Schoul By Nagt. J. H van Kinſbergen uitgegeeven door* GERHARD AALBERS, *Lieutenant ter Fee, reſſorteerende onder het Edelmogend Collegie ter Admiraliteit van Amſterdam. Te Amſterdam, by J. C. Roeder* 72 Pages 8vo.

This is an entirely practical pamphlet, explaining the moſt common manner of working ſhips in the Dutch Navy, and uſeful to young beginners ſerving in the ſaid navy. The Dutch Navy is provided with two other little books of almoſt the ſame kind, but relating more particularly to the rigging and inner diſpoſition of their ſhips, together with ſome other uſeful knowledge for actual ſervice at ſea. The firſt is,

Handboekje voor dee Zee-deerling, zynde een beknopte Beſchryving der Toeluitlinge van een Oorlogſchip, Zoo als ieder Charter tot Amſterdam ſedert eenige jaaren is uitgeruſt. Benevens een Verhaal van verſcheidene Zaaken die hy kennen moet, bevoorens Zyn bevordering tot Lieutenant Door M. LAMBRECHTS, *Kaptein ter Zee. Tweeden Drak t'Amſterdam, by Joannes van Keulen*, 1742. xvi Pages Prefaces, &c. 264 Pages 8vo.

The ſecond is a kind of ſupplement to the laſt mentioned, containing ſome modern alterations in the Dutch navy. The author of it is the preſent Admiral Kinſbergen.

Korte Inſtructien betreffende den Zeedienſt door J. H. KINSBERGEN, *Commandeur ter Zee. Te Amſterdam, by J. Morterre.* xxiv Pages Prefaces, &c. 103 Pages 8vo.

27. Another ſhort treatiſe on the ſame object, written in Swediſh, is alſo deſigned originally for the inſtruction of young beginners, and is reported to treat all this matter, together with the moſt principal and chief principles of building and ſtowing ſhips, on five ſheets and a half in 8vo. The author of it ſigns his name to the dedication *Dav. Sjöbohm*. The title of it is:

Forſok til el kort Utkaſt om Sjo-Manœuvren. Stockholm for Holmberg.

THIRD

SECTION III.

WRITINGS

RELATING TO THE

PRACTICE of the ART of SHIP-BUILDING.

1. AT the head of the practical writings on the Art of Ship-Building, I mention ſome titles of books of which I am not able to give any further notice than only of their exiſtence. The greater part I found enumerated in the Dedication of the book of *Cornelis van Yk*, No. 6. of this Section, with ſeveral others that evidently do not belong to this Section; and think myſelf obliged to remark, that if any perſon ſhould not find theſe books mentioned in the ſaid place, this mention muſt not be condemned as a falſe one. The copy of it in my own poſſeſſion does not contain them; but I found them in another copy which I had occaſion to ſee in the valuable collection of books belonging to the celebrated Univerſity of Gottingen. As my own copy (except the Dedication) ſeems to be of the very ſame print with the laſt mentioned (as far as this may be judged by an old extract I made of it about twenty years ago), I imagine that the Dedication given out with the firſt copies has been changed afterwards for another. The writers mentioned by Cornelis van Yk as his predeceſſors are the following:

1. *The complete Modeliſt.*
2. *Samuel Pepys' Architectura Navalis.* } ENGLISH.

3. *Sanſon.* 4. *Hobier.* 5. *Deſroches* (See No. 10. of the Firſt Section); and 6. *Robbe.* FRENCH.

7. *Fronſperger*, a GERMAN (whom I know as an author of an old book on the War by Land).

8. *Bartholomæus Creſcentius.*
9. *Architectura Nautica, by Vaſconcelli*, publiſhed at *Florence*, } ITALIANS.

And 10. *Hendrick Stevin van de Wiſkonſtige Scheepvaart*, a DUTCH author, and his work is perhaps a theoretical one.

I join to theſe the two following, as I do not know more about them:

1. *Marine Architecture*; or, *Directions for building and rigging of a Ship, from the laying of her Keel to her actual going to Sea. London, printed for W. and J. Mount, and T. Page, on Tower-Hill* (from a Catalogue of Books printed for the ſaid Bookſellers at the head of the *Mariner's New Kalendar, by Nathanael Colſon*, 1747. 4to. which is perhaps the ſame book with No. 9. of this Section.

2. DON ANTONIO DE GASTANETA *Proporciones de las Medidas—para Fabrica de Navios* (a Spaniſh author mentioned in the *Examen Maritime of Don George Juan*, liv. v. chap. ii. ſect. 517, page 322 of the tranſlation referred to, Sect. II. No. 15.

2. *Architectura Navalis.* **Das iſt**: *Von dem Schiff Gebaw, Auff dem Meer und Seekuſten zu gebrauchen Und Nemblich In was Form und Geſtallt, Furs Erſte, Ein Galea, Galeazza, Galiotta, Bergantino, Filucca, Fregata, Liudo, Barchetta, Piatta: Zum Andern Ein Nave, Polaca, Tartana, Barcone, Caramuzzala, und ein gemeine Barca (welche ſamptlich zu Krieg und Friedens Zeitten adjetzo in den Vornembſten Meer-Porten zu finden) nach verſtandlicher, gewiſſer Regul, und unfehlbahrer*

beſtandiger Ordnung ſollen erbawen werden. Allen, Auff dem Meerpracticirten Liebkabern, Wie auch den Bawmeiſtern, und Mahlern zum Wohlgefallen, und ſonderbaren Nutzbarkeiten ; Auſz ſelbſt geſekenen, und mit allem Fleiſz zuſammengetragenen und aufgezeichneten Wercken : Nebſt kurtz-widerholter Furbildung, der in Anno 1571 *zwiſchen Turcken und Chriſten furgegangenen, hochernſtlichen, Anſehnlichen Meerſchlacht ; Sampt vielen Abriſſen ; und noch daruber* 20 *dem Natural gar ahnlich-undrecht Conterſehtiſchen Kupfferſtucken, complirt, auſzgeruſtet und in gegenwertigem Corpore gantz Eygentlich beſchrieben durch* JOSEPHUM FURTTENBACH, *Mil. Rom. Kay. May Freyheit in* 12 *Fahren nicht nach zu trucken Getrackt in des Heiligen Romiſchen Reichs Statt Ulm, durch Fonam Saurn, Beſtellten Buchtruckern daſelbſten. Anno* 1629. *Franckfurt, bey Clemens Schleichen, und Peter de Zetter zu finden.* 9 Sheets Prefaces and Contents, 134 Pages folio.

I always fancied this book to be very inſtructive, for the old true and genuine technical terms of the German tongue ; but on a nearer acquaintance with it, I find myſelf greatly miſtaken. The good Mr. *Furſtenbach* did not trouble his head about them, and kept always the Italian terms. For the reſt, this book is very inſtructive for the Italian, or more properly the Venetian manner of conſtruction at the beginning of the laſt century. For inſtructions of modern ſhip-building nobody will apply to it.

3. *Aeloude en Hedendaegſche Scheepſbouw en Beſtier : Waerin wiitloopig wert verhandelt de wiize van Scheeps timmeren by Grieken en Romeynen : Scheepsœffeningen, Striiden, Tucht, Straffe, Wetten en gewoonten. Beneffens Evenmaatige grootheeden van Scheepen onſes tijds, ontleet in alle Naare deelen : Verſchil van bouwen tuſſchen uitheemſchen en onzen landaert : Indiſh Vaertuygh : Galii bouw ; Nedendaegſche Scheeps-plichten : Verriikt met een Reex verklaerde Zeemans Spreekwoorden en benamingen. Doorgaans met veele Kopere Plaaten. Beſchreeven door* NICOLAES WITSEN, *t'Amſterdam, by C. Commelyn ; Broer en J. Appelaer,* 1671. *Met Privil. voor* 15. *Jaaren.* 5 Sheets Prefaces and Regiſter, 516 Pages, and an Appendix of 40 Pages. 114 Copper-Plates, beſides the Author's Portrait and the Frontiſpiece, Folio (commonly ſold at preſent for 20—25 Dutch Florins).

The Author, an Alderman of the city of Amſterdam, treats, with a great expence of learning, and a ſtill greater quantity of ſometimes ſingular conjectures, very diffuſely on the manner of ſhip-building of the Ancients ; the moſt certain of the which we know ſeems to me to be, that, with exception of ſome fragments, we are ignorant of its particulars. Of more modern ſhip-building, and the manner in uſe under the author's eye, we find ſome inſtructive notices, but almoſt nothing that may be deemed of practical uſe out of Holland, as it only tends to ſhew how much attached the Dutch ſtill are to many cuſtoms of their anceſtors.

4. *L'Architecture Navale : contenant, la Maniere de conſtruire les Navires, Galeres, et Chaloupes ; et la Definition de pluſieurs autres eſpeces de Vaiſſeaux. Avec les Tables des Longitudes, Latitudes, et Marées, Cours et Diſtances des principaux Ports des quatre Parties du Monde ; une Deſcription des Dangers Ecueuils, et l'Explication des Termes de la Marine. Le tout enrichy de Figures. Par le* SIEUR DASSIE, *C. R. A Paris, chez J. de la Caille,* 1677. *Avec Priv. du Roi.* 8 Pages Dedication and Preface, 285 Pages 4to.

A book which, notwithſtanding its antiquity, may be of ſome modern uſe. The authors of the French *Encyclopedie Marine* mention it in the article "Banquette," tom. i. page 96, with the following remark: "*Cet ouvrage contient des Details qu'on ne trouve point ailleurs, et dont nous proſitons quelquefois, mais il eſt fait avec bien de la negligence.*"

5. *Conſtruction aes Vaiſſeaux du Roy et le Nom de toutes les Pieces qui y entrent Marquees en la Table par numero. Avec toutes les Proportions des Rangs, leur Explication et l'Exerciſe du Canon. Au Havre de Grace, chez J. Habault,* 1691. 140 Pages 8vo.

The contents appear from the title-page; and that the greateſt part of the ſcantlings and dimenſions given therein are at preſent much changed ſeems to require no particular mention.

6. *De vederlandſche Scheepſbouwkonſt Open Geſtelt. Vertoonende naa wat Regel, of Eevenredenheyd, in Nederland meeſt alle Scheepen worden gebouwd; mitigaders, Muſten, Zeylen, Ankers en Touwen enz. daar an gepaſt. Soo uit de Schriften van ouder, als jonger Bouw-Meeſters, als ook by eygen Ondervindinge, tot nut van alle jonge Bouw-Meeſters, en Knechten als ook Uitreeders, en Liefhebbers van Scheepen t'Samen geſtelt door* CORNELIS VAN YK, *Scheepſtimmerman. Met Kopere Figuren ter Materie diepende, verrykt. Gedrukt, by A. Voorſtad tot Delft. Voor J. ten Hoorn tot Amſterdam,* 1697. 4 Sheets and a Half Dedication, Preface, Epilogue, and Contents, 364 Pages Folio (See the Remark No. 1 of this Section).

Many good practical rules; little or no learning and antiquities; though the Author begins with conjectures on the ark of Noah: all together, dimenſions, ſcantlings, and aſſembling of the particular pieces, in the old Dutch over-ſtrong, and in England commonly called clumſy manner.

7. *a. Nieuwe Hollandſe Scheeps Bouw. Vertoonende een Volmaakt Schip, Met alle deſzelſs interlyke deelen, met nommers verklaart; als meede 't affloopend Schip; voorts de Hollandſe Admiraal op verſcheide manieren; noch een Doorgeſnede Schip van de eerſte rang; mitſgaders eenige doorgeſneede Scheepſdelen (een Admiraliteits-Jagt) Booten en Slæpen, en in 't voorbygaan de Engelſe en Franſe Admiraalen, 't Kielhaalen van Scheepen, Ankers, Gally-Scheepen, verſcheide Compaſſen, Quadrant, Nacht-wyſer, Graad-en Spiegel-boog; voorts allerhande Scheeps-Waggen, met haare Wapenen, Coleuren en Oorſprong. Als mede een Beſchrywing van't Bouwen en Toetakelen van allerly Scheepen, na de maat; verſcheide Werktuigen, loſſe Scheepſdeelen, Scheepſkmanen, te zamen in omtrent* 190 *Kopere. Platen naawkeurig en na de nieuwſte manier verbleed. Komt hier noch agterby, de menier om't ſtaande Want te kerven, van't Tocruſten van Scheepen, en eindelyk om een Schip wel in Zee te bewerken, by alderhande weer. Texamen geſteld door* CAREL ALLARD, 2 *Deelen. Tot Amſterdam, by Carel Allard, op den Dam.* 1705. *Met Privil. vande Ed. Gr. Mag. H. Staaten van Holl en Weſt-vrieſland,* 4to.

An entirely practical work, but with much leſs order and digeſtion than any of the former. The whole ſeems to be more a collection of detached particular extracts and intelligences aſſembled by chance, than to be calculated for a well-digeſted inſtruction.

7. b. Probably the great number of cuts and copper-plates of the foregoing work reſting uſeleſs in the hands of the bookſellers induced a reprint of them with a French explanation. As for the reſt, theſe two works are very ſimilar.

L'Art de batir les Vaiſſeaux, et d'en Perfectionner la Conſtruction; de les garnir de leurs Apparaux, les mettre en Funin, les Manœuvrer, &c. Avec la Coupe d'un Vaiſſeau du Premier Rang, les Devis de pluſieurs Sortes de Vaiſſeaux, les Outils et Machines des Ateliers de Conſtruction, les Inſtrumens de Mathematique ſervans à la Navigation, leurs Deſcriptions et Figures: Diverſes Liſtes et Tables concernant la Conſtruction, l'Equipement, &c. outre Pavillons de divers Etats. Le tout tire des meilleurs Auteurs Hollandois, comme Witſen, van Eyk, Allard, &c. Tome premier. A Amſterdam, chez D. Mortier, 1719. 82 Pages 4to. tome II. 94 Pages. Both with a great quantity of Copper-Plates.

After this tome II. there follows another tome II. whoſe title is:

Les Pavillons, ou les Bannieres que la plupart des Nations arborent en Mer, comme font ceux d'Angleterre, d'Ecoſſe et d'Irlande, des Provinces Unies des Pays Bas, de l'Eſpagne, du Portugal, de l'Italie, de France, du Dannemarc, de la Suede, de la Pologne, de Pruſſe, de l'Allemagne, de Moſcovie, de Turquie, de Barbarie, et des Indes Orientales, &c. TOME SECOND. *A Amſterdam, chez D. Mortier,* 1718. 24 printed Pages 4to. 90 Copper-plates, and after them the Regiſter to the whole, printed on a ſheet and a half.

8. *The Accompliſhed Shipwright and Mariner; containing, The Principles of Geometry, Meaſuring of Board and Timber; with the Moulds, and Way of Shaping the Body of any Ship; and how they burthen, by Geometrical Demonſtration and Arithmetical Proof. Alſo, how to equip and navigate them; with a Table of Squares and Cubes; and the Extraction of the Square and Cube Root; with their Uſe. Alſo, Rules for finding the Length of the Maſts, Yards, Rigging, &c. How to make the Sails, Proportion the Anchors and Cables: with uſeful Tables therein; and Rules in Sea Gunnery. Together with Rules to find the Prime, Epact, &c. &c. Alſo, Making the plain Scale, and its Uſe in Navigation, &c. &c. Likewiſe Tables of the right Aſcenſion of the Sun, &c. &c. By* JOHN HARDINGHAM, *of Great Yarmouth. To which is added, A correct Table of the Latitude and Longitude of the moſt notable Capes, Head-Lands, and Iſlands in the World, By* JOHN THORNTON. *London, printed for and ſold by J. Thornton and H. White,* 1706. 1 Sheet and a half Dedication and Prefaces, 406 Pages 4to. with wooden Cuts and Copper-plates.

The title of this work is of ſuch an enormous length, that I copied it without alteration only ſo far as its contents related to the preſent ſubject, conſidering the contents of the firſt ſeventy-ſeven pages belonging only to our preſent ſcope, and for the reſt abridged it. The rules in it, according to the contents of the title-page, are given in a ſomewhat confuſed manner; among which thoſe ſeem to be moſt worthy of any particular mention, by which the author ſeems to intend to give an explanation of a general method to run the riſing line in whole moulding, and the narrowing of the floor, &c.; the which, though they will prove to be not of an entire general application, ſeem to give for particular conſtructions tolerable good forms. As we are at preſent furniſhed with more valuable treatiſes of the ſame kind, this work is not at all recommendable for practical uſe, and may help only to complete a collection of treatiſes on the art of ſhip building, and ſerve in the whole ſeries as a pattern, to ſhew in what a chaotic and perplexed manner the rules of the art of ſhip-building may have been delivered in former times.

9. *The Ship-Builder's Aſſiſtant; or, Some Eſſays towards compleating the Art of Marine Architecture; viz.* 1. *A general Introduction; wherein is conſidered the Solid of leaſt Reſiſtance, ſo far as relates to the Formation of the Ship's Body, &c.* 2. *Obſervations for regulating its Price of Timber, taken from the Proportion of the different Dimenſions, with Eſtimates of the Value of Oak Timber, and ſeveral other Materials relating to naval Stores.* 3. *Rules for building the Hull of any Sort of Ships: to which is added, the Scantling or Meaſuring of Ships Timbers, and ſome Directions about Moulding them.* 4. *A new Method for finding the Tonnage of any Ship.* 5. *Rules for proportioning the Rigging. To which is annexed, An Explication of the principal Terms uſed in this Art. The Whole illuſtrated with many Schemes proper to*

each Part; moſt of them from Copper-plates. By WILLIAM SUTHERLAND, *Shipwright and Mariner. Printed for Tho. Page, W. and F. Mount,* 1726. 1 Sheet Preface, 164 Pages 4to. with many wooden Cuts.

The contents of this book, in the extent they may be enumerated here, appear from the above copy of the title-page; and that this book is yet at preſent deemed uſeful appears from a new edition made of it in the year 1784, under the following title, which accounts at the ſame time for the moſt remarkable changes made in this new edition, beſides many others not mentioned thereon:

The Ship-builder's Aſſiſtant; or, Marine Architecture. Containing, 1. *Decimals, the Extraction of the Square and Cube Roots. Alſo, Geometry and Menſuration; with Rules for finding the Content of Plank and Timber. Alſo, the Tonnage of Ships; illuſtrated by proper Examples.* 2. *Obſervations on the Nature and Value of Timber, and how to procure it in neceſſary Forms for Ship-building.* 3. *The Method of drawing Plans of Ships, and moulding their Timbers, with the practical Rules to be obſerved in building the Hulls of different Ships; to which is added, the Scantling or Dimenſion of Ships-Timbers.* 4. *Directions for making Maſts and Yards in juſt Proportion to the Ship, and to each other. Alſo Tables of Weights and Sizes of Anchors and Cables, according to the new Eſtabliſhment.* 5. *The Boatſwain's Art: Shewing the Method of finding the Length and Thickneſs of every Rope. Alſo, Cable and Cordage Tables; ſhewing by Inſpection the Weight of any Rope. With Directions for cutting-out Sails. The whole reviſed, corrected, and illuſtrated with many Copper-plates. By* WILLIAM SUTHERLAND, *Shipwright and Mariner. London, printed for Mount and Page,* 1784. 156 Pages 4to. 8 Copper-plates.

How it is poſſible, that in reſpect to the moſt remarkable changes in the value of timber, the prices given in the firſt edition of 1726, and reprinted without any alteration in the edition of 1784, may be ſuitable for the preſent time, I am not able to account for.

10. *Britain's Glory; or, Ship-building unveiled: Being a general Director for building and compleating the ſaid Machines. By* WILLIAM SUTHERLAND, *Author of the Ship-Builder's Aſſiſtant.* THE SECOND EDITION. *London, printed for A. Betteſworth, S. Fitzer, and E. Midwinter,* 1729 (The copy in the collection of the Univerſity of Gottingen).

THE SECOND EDITION. *London, printed for W. Mount and Tho. Page,* 1740 (another copy in preſent before me).

Both theſe SECOND *editions* ſeem to differ in nothing but in the title-page (as may be gueſſed from compariſon of an old extract made many years ago from the firſt-mentioned copy with the copy now before me). The firſt part contains 134, the ſecond 286, pages folio. The firſt has ſeveral wooden cuts and ſingle copper-plates, the ſecond wooden cuts only. The ſecond part has a ſeparate title as follows:

Prices of the Labour of Ship-building adjuſted; or, The Myſtery of Ship-building unveiled: Being a brief Explanation of the Value of the labouring Part in Ship-building; from a Ship of the biggeſt Magnitude to a ſmall Boat. Firſt ſhewing the Working the whole Ship, according to the Length, Breadth, Depth, and Gut; and then by Sub-Diviſions ſhews the value of every particular Part. London, printed by D. L. in the Year 1717.

The book in general contains ſome very good practical advice; and the Second Part in particular is very inſtructive for the contracting part of ſhip-building with the workmen, as alſo for explanation of the different kinds of workmanſhip, in making devices of coſt as well for building as for repairs. It is not the place here to point out ſome whimſical oddities of the author which intitle this book likewiſe to a place in a collection of curioſities.

11. *Elemens de l'Architecture Navale; ou, Traite pratique de la Conſtruction des Vaiſſeaux. Par M.* DU HAMEL DE MONCEAU, *de l'Acad. R. des Scienc. de la Soc. R. de Londres, Honor. de la Soc. d'Edinbourg, et de l'Acad. de Marine, Inſpecteur-General de la Marine. A Paris, chez Ch. A. Jombert,* 1752. *Avec Approb. et Privil. du Roi,* 4to. xl Pages Preface, 464 Pages 4to. 24 Copper-Plates.

The ſecond edition of the year 1758 has this addition on the title-page: *Nouvelle Edition, revue, corrigee et augmentee par l'Auteur.* xliv Pages Preface, 484 Pages 4to. and 24 Copper-Plates.

The modern French ſhip-builders of the moſt reſpectable authority declare this to be by far the beſt practical work in their language; and particularly for the inſtructions to make draughts of ſhips, explained very diffuſely in it; in particular to form the ſhape of the timbers in the body-plan, by help of equilateral triangles, quadrants, and the ſquare ribbands (without any uſe of different ſweeps or parts of circle, by which the timbers are commonly formed in the Engliſh manner to make a body-plan). An explanation of whole moulding, contained in the firſt edition, is omitted in the ſecond. In explaining theſe different manners of forming the draughts, the author generally confines himſelf to the form of the hull, without much reſpect to the ornamental parts, leaving them entirely to the taſte of the builder. At the end of the work he gives an introduction to the theory of ſhip-building, enlarged in the ſecond edition by a whole chapter; and the whole treatiſe is occaſionally interwoven with uſeful remarks. The book No. 13. of this Section contains, by way of appendix, a very good Engliſh abridgement of it, which repreſents the moſt eſſential parts of the author's explication in a much more conciſe, and not quite ſo expanded ſtyle as that of the original. The author reſtricts himſelf only to line of-battle ſhips; and what he ſays of frigates or other kinds of veſſels is very little, and reported almoſt occaſionally. Beſides the abovementioned abridgement, there are two other tranſlations of it. The firſt a Dutch one:

Grondbeginſelen van den Scheepſbouw, of werkdadige Verhandeling der Scheepſtimmerkunſt; in't Franſch beſchreeven door den Heer DU HAMEL DE MONCEAU, *&c. &c. En in het Neederduits gebracht door een Liefhebber der vrye Kunſten. Zynde deeſe Vertaating onder opzigt van twee beroemde Hollandſche Scheepſbouwers verryckt met eenige aantekeningen, voor ongeoeffende in de Franſche Scheepſtimmerkunſt en in de Meetkunde. In's Gravenhage, by G. v. Thol. T'Amſterdam, by G. de Groot,* 1759. x. Pages Preface. 349 Pages. 20 Pages Index. 4to. Maj.

This very good tranſlation is made after the firſt edition of the original. The ſecond is in German:

Anfangſgrunde der Schiffbaukunſt, oder practiſche Abhandlung uber den Schiffbau. Aus dem Franzoſiſchen des Herrn Du Hamel de Monceau, *&c. &c. nach der zweyten Ausgabe des Originals uberſezt von* C. G. D. Muller, *Capitain des Konigz. Groſbrit. und Churfurſtz. Braunſchw. Luneb. Wachtſchiffs auf der Elbe. Berlin, bey Joachim Pauli, Buchhandler,* 1791. lxxii. Pages Prefaces. 518 Pages 4to. 18 Copper-Plates 4to.

Such is the title of it, made after the ſecond edition. The tranſlator has endeavoured to render it more uſeful to German ſhip-builders, by additions relating to the building of merchantmen, as all Germany has not a ſingle line-of-battle ſhip, which are the author's principal object.

12. *Verhandeling van aen Hollandſchen Scheepſbouw, raakende de verſchillende Charters des Oorlogſcheepen tot s'Lands Dienſt en ter betrachtinge van alle beſpiegelnde en werkdaadige der Hollandſche Scheepſbouwkunde in 't neederduits beſchreeven door* L'van Zwyndregt, *Scheepſboumeeſter van't Edelmog. Admiraliteyts-Collegie aan de Maaje Waarby tot een Aanhangſel gevoegt is eene Verhandeling van't bouwen der Roopvaardy ſcheepen door* C. de Ruiter, *Scheepſbouwer, &c. In's Gravenhage, by P. de Hondt en H. Scheurleer,* 1757. xii Pages Prefaces, 106 Pages the firſt Treatiſe. The Appendix from Page 107—126. 8 Copper-Plates 4to.

This book explains principally the difference of the Dutch manner of building their men of war from that of other nations, and contains a very good table of the ſcantlings of timber, as uſed in Holland, and many good practical remarks, particularly for repairs. The Appendix is very ſhort; and what the art loſes by its author not being diſpoſed to ſhew all his ſkill (as, conformable to his principles, the maſter muſt keep his beſt trick for himſelf), ſeems not to be of the higheſt conſequence. The whole book ſeems to owe its origin to a *jealouſy* of Mr. *Du Hamel's* before-mentioned work; and intended to demonſtrate, that the Dutch ſhip-builders are not leſs ſkilful than the French. How far this demonſtration may be ſatisfactory, the author of this ſketch will not decide, as his judgment would ſeem partial to the French ſide, and perhaps be attributed to his being the German tranſlator of the book that cauſed this conteſt.

13. *A Treatiſe on Ship-building and Navigation, in three Parts; wherein the Theory, Practice, and Application, of all the neceſſary Inſtruments are perſpicuouſly handled. With the Conſtruction and Uſe of a new-invented Shipwright's Sector for readily laying down and delineating Ships, whether of ſimilar or diſſimilar Forms. Alſo, Tables of the Sun's Declination, of Meridional Parts, of Difference of Latitude and Departure, of Logarithms, and of artificial Sines, Tangents, and Secants. With an Engliſh Abridgement of another Treatiſe on Naval Architecture, lately publiſhed at Paris, by Mr. Du Hamel, &c. &c. To which is now added, A Supplement; containing, A Tranſlation of what M. Bouguer, another French Author, has written on that Subject; and M. Du Hamel's Method of finding the Centre of Gravity; with ſome Remarks by the Author. The whole illuſtrated with Twenty Three Copper-Plates. By* Mungo Murray. *The Second Edition. London, printed for A. Millar,* 1765. One Sheet and a half Prefaces. The firſt Part 354 Pages; the Abridgement of Mr. Du Hamel 70 Pages; that of Mr. Bouguer's *Traite du Navire*, and the Author's Remark's on Maſting, 177 Pages, 4to. Maj. (1 liv. 6 ſ.)

The deſign of the author, perhaps only of the printer, to enlarge the book to a certain ſize, ſeems to have cauſed the inſertion of the treatiſe on navigation, with many tables quite foreign to the art of ſhip-building, which make the purchaſe of the book much more expenſive, and will certainly be in a certain manner an obſtacle to its becoming more popular, as England abounds with books on navigation. The treatiſe on ſhip-building contained therein is very good and uſeful; and has this advantage over others of the ſame kind, that the author proceeds from the true principles of the art in making plans, and to enlarge them for actual building on the moulding-loft, wherefrom all ought to proceed properly, *viz.* the doctrine of orthographical projection: this ſpares him a great deal of trouble in his further explanations, abridges them, and renders them the more perſpicuous. The abridgements of the two French works contained therein make it ſtill more recommendable; as that of Mr. *Du Hamel's* book principally is ſo complete as to render the original almoſt ſuperfluous for every-one provided with this abridgement. In reſpect to the abridgement of Mr. *Bouguer's Traité du Navire* the caſe is ſomewhat different. Though the abridgement is made very judiciouſly, and contains a fair explanation of Mr. Bouguer's theory, it will perhaps not be quite ſatisfactory to ſuch as wiſh to follow Mr. *Bouguer* in his analytical calculations; but this, perhaps, will prove the more uſeful to ſuch as are not apt to attend Mr. Bouguer therein.

14. *Architectura Navalis Mercatoria, Navium varii Generis Mercatoriarum, capulicarum, curſoriarum aliarumque cujuſcunque conditionis vel molis, formas et rationes exhibens, exemplis aere inviſis, demonſtrationibus, denique dimenſionibus, calculiſque accuratiſſime illuſtrata. Auctore* FRIDIRICO. HENR. CHAPMAN, *S. R. Majeſt. Naupego. R. Acad. Scient. Suec. Membr. Holmine,* 1768. *Atlas Form,* 61 Plates *(*180 Dutch Florins*).*

The capital book of this branch, and in conjunction with the book No. 16. Sect. II. of the theoretical works, the moſt complete ſyſtem of naval architecture exiſting, as well for theory as practice, and which perhaps will not be ſurpaſſed eaſily. With the exception of line-of-battle ſhips (the conſtruction of which is explained in almoſt every other treatiſe on ſhip-building) there are not many valuable kinds of veſſels uſed in the European ſeas, for which there will not be found inſtructions in it. Every practical ſhip-builder provided with it will diſcover, if h only underſtands how to make a fair uſe of it, full inſtruction even for ſuch kinds and ſizes of veſſels as are not contained directly therein. To the beſt inſtructed ſhip-builders it will ſerve alſo to guide their meditations and ſpeculations; ſo that it is, if not indiſpenſable, certainly moſt recommendable to every one who has occaſion to put in practice this noble art; and the expence of its purchaſe, though not inconſiderable, and ſometimes heightened by greedineſs and the difficulty to procure it, will not be thrown away, but eaſily turned into clear profit.

15. *Inſtruction Elementaire et Raiſonnee ſur la Conſtruction Pratique des Vaiſſeaux, en Forme de Dictionaire. Ouvrage publie par Ordre de Mr. de Boynes, Secr. d'Etat ayant le Departement de la Marine. Par M.* DURANTI DE LIRONCOURT, *Enſeigne des Vaiſſeaux du Roi. A Paris, chez J. B. G.*

Muſier Fils, 1771. *Avec Approb. et Privil. du Roi.* xxxii Pages Prefaces, Index, &c. 271 Pages 8vo. (without Copper-plates.)

Very good, and as plain and clear as poſſible without the aſſiſtance of drawings; and very commendable in particular for the knowledge of the French terms of art, and of the French manner of building in particular. It is not quite complete, though it would be an injuſtice to call it very defective.

16. *Eſſai Geometrique et Pratique ſur l'Architecture Navale à l'Uſage des Gens de Mer. Par M.* VIAL DU CLAIRBOIS. *Tome premier, contenant le Diſcours. A Breſt, chez R. Malaſſis. Paris, chez Durand, Neveu. Avec Approb. et Privil.* 1776. xix Pages Preface. 373 Pages 8vo. *Tome Second, contenant les Planches.* 15 Copper-plates.

Likewiſe very inſtructing and uſeful for young beginners, and particularly remarkable for the many valuable remarks *in ſpecie,* in reſpect of ſlight errors contained in the book No. 11. of this Section; of which it may be called, in ſome manner, a corrected abridgement. It contains likewiſe a very ſhort *epitome,* or rather an elementary introduction to theory.

17. *Naval Architecture; or, Rudiments and Rules of Ship-building. Exemplified in a Series of Draughts and Plans. With Obſervations tending to the further Improvement of that important Art. Dedicated by Permiſſion to his Majeſty, by* MARMADUKE STALKAART. *London, printed for the Author, and ſold by J. Boydell, J. Dodſley, and J. Sewell,* 1781. 4 Sheets Dedication, Preface, and Index. 231 Pages Folio. 13 Copper-plates, in part of a very large ſize (6 liv. 6 ſ.).

For the particular inſtructions to make the draughts, and the enlarging them for actual building on the moulding-loft, the ampleſt and moſt ſatisfactory in my knowledge. Though the author ſeems to avoid ſtudiouſly every theoretical diſquiſition, there will be found in it very judicious remarks uſeful to them. The deſcription of the plans is printed in the ſame elegant ſtyle as the copper-plates are engraved; and the whole work has, in reſpect to external elegance, and the moſt minute and nice finiſhing of the draughts, no rival among all mentioned in this ſketch, and may be duly called the moſt elegant and ſplendid work of the kind. The author confines himſelf only to ſhips belonging to the navy. The very high price will be, out of England, an obſtacle to its becoming more univerſally known.

18. *A general View of the Dimenſions of the moſt approved Ship of each Claſs in the Britiſh Navy; with the exact Dimenſions of her Maſts, Yards, Rigging, Blocks, Guns, Gun-Carriages, and Cables, according to the Eſtabliſhment in* 1778. *London, printed for Steel,* 1782. (5s.)

A table printed on two large ſheets joined; containing, as the title announces, beſides ſome uſeful knowledge of this branch, many others which do not belong immediately to it, though they are cloſely connected with the former.

19. *Principles of Naval Architecture; with Propoſals for improving the Form of Ships. To which are added, Some Obſervations on the Structure of Carriages for the Purpoſe of Inland Commerce, Agriculture, &c.* By THOMAS GORDON, *Eſq. London, by Evans*, 1784. 207 Pages 8vo. 5 Copper-plates.

Several good propoſals, among others that ſeem not very practicable, yet always a tolerably good contribution to that which Mr. *Du Hamel* calls *the metaphyſic of ſhip-building* (a manner of drawing general concluſions by a general ventilation and balancing of the *pro* and *con* of general principles, without a particular determination for a given caſe); and among theſe ſingle very valuable hiſtorical remarks relating to ſhip-building.

20. *Traite Elementaire de la Conſtruction des Vaiſſeaux à l'Uſage des Eleves de la Marine, compoſé et publié d'apres les Ordres de Monſeigneur le Marechal de Caſtries, Min. et Secr. d'Et au Depart. de la Marine.* Par M. VIAL DU CLAIRBOIS, *Ingenieur Conſtructeur ordinaire de la Marine, de pluſieurs Acad. (cet ouvr. ſe vend rel. en veau pour* 13 *livr. Aux Eleves de la Marine.* 6 *livr. broche.) A Paris, chez Clouſier*, 1787. 308 Pages 4to. 20 Copper-plates.

This is the fourth time that Mr. *Vial du Clairbois* furniſhes a particular occaſion to mention his name in the number of writers on the art of ſhip-building, and to declare our approbation of this his fourth work, in the ſame manner as of the foregoing. It contains the beſt and cleareſt inſtructions for beginners, and anſwers perfectly its author's deſign, which is, to give to young ſea-officers who are not deſtined to be ſhip-builders a pertinent idea of the ſeveral particular parts whereof a ſhip is compoſed, and the manner of aſſembling them to a whole: to this is annexed, a ſlight ſketch of the theory. At the ſame time it is very inſtructive to young beginners in the art of ſhip-building, as it contains one of the moſt complete and clear deſcriptions of the bolting of ſhips, and all the iron-work of the hull, and notices of the ordering a ſhip-builder's yard, the different manners of launching ſhips, &c.

21. *The Ship-builder's Repoſitory; or, A Treatiſe on Marine Architecture. Wherein are contained, the Principles of that Art, with the Theory and practical Parts fully explained; and every Inſtruction required in the building and completing a Ship of every Claſs, from the forming of the Draught to the launching into the Water, calculated to the Capacity of young Beginners. Compiled and digeſted in a Manner entirely new, and laid down different from what has hitherto appeared on the Subject. The Whole being intended as a complete Companion for thoſe Naval Architects deſirous of attaining a competent Knowledge of that important Art. London, printed for the Author* (without the Year). 472 Pages 4to. and a large Copper-plate (1 liv. 1 ſ.).

The theoretical part gives a conciſe view of the moſt eſſential parts of the more ancient theories on the calculations of the reſiſtance of ſhips and of the ſituations of the centre of gravity of the immerſed part conſidered as an homogene compoſition, with ſome general remarks on the form of ſhips. The practical part, by far the largeſt and moſt valuable is diſtinguiſhed and remarkable principally for a very extenſive table of the ſcantlings of every ſingle piece entering into the conſtruction of a ſhip

an

and is preferable to many others, as it contains the dimenſions of the bolts and iron-work : but the uſe of this table has this inconvenience, that it is not arranged in an alphabetical or any other manner which renders the finding of the ſingle articles contained in it eaſy ; ſo that it requires a kind of familiarity with it to get directly at the inſtruction wanted in a particular caſe. Very valuable are the dimenſions of a great variety of ſhips (from the largeſt to the ſmalleſt ſize) given in it, for laying down the body-plans of them on the mould-loft. The inſtruction for forming the draughts of ſhips, exemplified on the plan of an eighty gun ſhip, is very plain and ſatisfactory ; and the explanation of the draught of the inner parts of a ſhip, moſtly neglected in other works of the ſame kind, deſerves to be mentioned as a particular merit in this work. The laudable deſign of the author to render it more uſeful by a low price, did not allow him to give more copper-plates. However, it cannot be denied that his explanations for laying-down ſhips on the mould-loft would have been more inſtructive by the addition of a ſingle plate more, as in the manner in which they are given at preſent, they will prove ſatisfactory only to ſuch as are already ſomewhat acquainted with the work.

22. Another book, though it does not properly belong to this Section, yet as it has a cloſe relation to the internal diſpoſition of ſhips of war, and gives a demonſtration to what a degree of refinement the French have riſen in that point, to render the diſpoſition of the charge of each part of a ſhip of war moſt proportionate to its capacity, and to diſpoſe the conſumption of the victuals, and other conſumptibles, according to this proportion, ſeems to deſerve an honourable mention in this Series :

Arrimage des Vaiſſeaux, publié par Ordre du Roi ſous le Miniſtere de M. le Comte de la Luzerne, Min. et Secr. d'Etat ayant le Departement de la Marine et des Colonies. Par M. MISSIESSY QUIES, *Lieutenant de Vaiſſeau. A Paris de l'Impr. Roy,* 1789. 152 Pages 4to. 6 Copper-plates.

It contains a moſt minute deſcription of the very judicious arrangement of the quite new internal diſpoſition and ſtowage of a new French man of war, *the Leopard,* conſtructed by Mr. *Sané.*

23. I ſhall conclude this Series by mentioning another very valuable book, which contains a treaſure of naval knowledge of every kind (preſented to the world by a moſt experienced able ſeaman, who is at preſent finiſhing his honourable career as dock-maſter at Liverpool, as a legacy of what he gathered of uſeful knowledge from a very extenſive experience), and which contains, among many other moſt uſeful remarks, very ingenious counſels on the conſtruction of merchant-ſhips and their management. (The year of the Firſt Edition I do not know.)

The Second Edition, conſiderably enlarged, of a Treatiſe on Practical Seamanſhip ; with new and important Hints and Remarks relating thereto. Deſigned to contribute ſomething towards fixing Rules, upon philoſophical and rational Principles, for the Form and proportional Dimenſions in Length, Breadth, and Depth, of Merchant Ships in General, and the Management of them ; and alſo to render Navigation in general more perfect, and conſequently leſs dangerous and deſtructive to Health, Lives, and Property. By WILLIAM HUTCHIN-

SON, *Mariner, and Dock-Maſter at Liverpool. Printed for the Author,* 1787. 270 Pages, 11 Copper-plates, 4to. (15s.)

24. Thus far my knowledge of the Literature of Ship-building, and of what relates to the preſent ſtate of that noble art. I have confined myſelf to what may be of direct uſe to the actual ſhip-builder, and have not mentioned anything of antiquities, and the manner of building in the moſt remote times, partly as not belonging to my plan, but more properly as an adequate judgment. or a mere relation of them requires a much greater acquaintance with the ſources wherefrom the knowledge of them may be gathered, than I have been able to acquire; and it is perhaps owing to my ignorance in reſpect of ancient ſhip-building, that I fancy enquiries of that kind to be of more conſequence to the antiquarian than to the practical man of the preſent day. Should any one be deſirous of accounts of Greek and Roman ſhip-building, and be deſtitute of better ſources to apply to, I hope the book of Mr. *Witſen*, No. 3. of this Section; JOH. SCHEFFER *de Militia Navali Veterum*, Upſal, 1654, 4to.; the ſame author and CHR. SCHEIBELER, in two different books of the ſame title, *de Varietate Navium*; a little memoir in the *Neue Kriegſbibliothek* of the year 1778, pag. 319, ff.; and Mr. *Le Roi*, in his *Nouvelles Recherches ſur le Vaiſſeau-long des Anciens, Paris,* 1786; will give him ſome knowledge, and ſhew the way to him where to get more. BAYFIUS, in his *Libello de Re Navali*, will acquaint him with the Latin technical terms.

25. I ſhall finiſh this Eſſay of a Sketch of the Literature of Ship-building by an enumeration of ſome detached memoirs and treatiſes on ſingle objects relating to Shipbuilding, and other arts nearly related to it. Perhaps a future occaſion may afford me an opportunity to complete this Collection by articles that are at preſent unknown to me.

26. MEMOIRS AND TREATISES ON PARTICULAR SUBJECTS RELATING TO SHIP-BUILDING.

(A.) ON GAUGING SHIPS.

Theorie et Pratique du Jaugeage, par le PERE PEZENAS.

Sur le Jaugeage des Vaiſſeaux, par M. MAIRAN.

(In the *Memoires de l'Acad. des Sciences de Paris,* 1724, Page 231. ff.)

Memoire ſur le Jaugeage des Navires, par M. BELLEUY, *de l'Acad. des Scienc. d'Amiens et Ing. Hydraulique de S. A. R. Monſeigneur le Comte d'Artois. A Paris, chez Barvois,* 1788. 80 Pages 8vo.

(B.) ON THE PRACTICAL DETERMINATION OF SITUATION OF THE CENTRE OF GRAVITY OF AN ARMED SHIP BY EXPERIMENT.

Ueber die richtige Art die Hohe des Schwerpuncts eines Schiffes anzugeben, wenn es ſich im Waſſer befindet, vollig ausgeruſtet oder nicht, wofern man nur den Riſs hat nach welchem es gebauet iſt. Von Friedr. Heinr. von Chapmann. —In the 8th *tome of the New Memoirs of the Royal Swediſh Academy of Sciences at Stockholm,* No. 4.

(C.) O

(C.) ON THE FORCE REQUIRED TO GET SHIPS OUT OF THE WATER TO PUT THEM ON SLIPS FOR REPAIRS, &c.

Calcul raiſonné de la Force d'un Appareil pour tirer un Vaiſſeau à Terre, par M. Thevenaud, *Capt. de Vaiſſeau, Commandant du Port de l'Orient.*—In the *Memoires de l'Academie Royale de Marine de Breſt, Tom.* I. 1773.

(D.) ON THE INNER DISPOSITION AND ARRANGEMENT OF FRENCH MEN OF WAR.

Remarks thereon are inſerted, by way of appendix, in the *Relation des deux Voyages dans les Mers Auſtrales et Indes faits par* M. de Kerguelen, *en* 1771—1779. (The ſame appendix contains other remarks, on the manner of making war at ſea on the Engliſh, &c. &c. But the book is very ſcarce, as it has been ſuppreſſed by an *Arret du Conſeil d'Etat du Roi* of the 3d of May 1783.)

(E.) ON THE STRUCTURE OF CAPSTERNS.

See Acta Acad. Scient. Imper. Petropol. pro Anno 1781. *Pars Prior*, No. 12, Page 105.

(F.) MISCELLANEOUS.

Sundry Maritime Remarks, by Benjamin Franklin.—The firſt memoir in the *Tranſactions of the American Philoſophical Society*, Vol. II. ; and again in B. Franklin's *Philoſophical and Miſcellaneous Papers. London, for Dilly*, 1787.

With theſe are connected, *Lettres de M.* David le Roi *à M. Franklin ſur la Marine, et particulierement ſur les Moyens de perfectionner la Navigation des Fleuves.*—In the *Journal de Phyſique, par M. de Roſiere, Annee* 1788. No. 5, *Mars*, and the following Numbers.

BRITISH MUSEUM

27. On Ship-Timber.

(A.) QUALITY AND DURATION OF SHIP-TIMBER.

Sur les moyens de rendre plus durables les Bois qu'on employe pour la Conſtruction des Navires, extrait des Memoires pour concouvrir au Prix de 1779, *par M. Pallas.*—In the *Acta Acad. Imper. Scient. Petrop. pro Anno* 1779. *Pars* I. near the end.

Abhandlung uber die langere Dauer und den Wiederſtand des Schiffbauholzes, gegen die an den Schiffen nagenden Seewurmer von Gottfr. Lud. Graszmann, *Prediger der Dorfer Sinzlow und Kortenhagen in Pommern. Stettin,* 1790. *Bey F. S. Kaffka.* 182 Pages 8vo.

(B.) TABLES FOR THE CUBATURE OF TIMBER.

Tarif general du Toiſe des Bois et de la Marque, avec une Inſtruction ſur le Bordage, et des Obſervations pour ſervir en quel tems et en quelle ſaiſon il faut abbatre les Bois, &c. A Paris, chez Baſtion, 1778. 388 Pages 8vo.

Traite de la Meſure des Bois, contenant le Tarif de la Reduction des Bois quarris en Pieds, en Pieds et Cubes, celui des Bois ronds en Pieds Cubes, et celui du ſciage des Bois en Pieds Quarres. Par M. Secondat. *(Nouv. Edit.) Toulon*, 1782.

Tabellen zur Berechnung des Maaſſes vom Holze dem Cubic nach, Quadratfuſſe, nebſt einer Tafel von den Verhaltniſſen der Stucke die Schiffbau erfordert werden, nebſt dem Abriſſe der Stucke. Hamburg, Virchaux, 8vo.

Tarif nouveau des Bois Quarres ; on trouve les Solides Pieds pouces et li à chaque Colonne, ſans avoir beſoin d'auqu'un calcul que deux lignes d'Add quand le tout ne ſe trouve pas ſur une ; on y a joint un Tarif pour la v ſelon le Toiſe, et non ſelon Rareme ; à chaque Colonne a tel prix que ce ſoi Comptes ſont faits, et encore un Tarif de la Meſure des Cercles à chaque li on y trouve le reſultat de la Circonference et du Total. Paris, chez l'Aut 74 Pages 12mo. (2 liv.)

28. BOOKS EXPLAINING THE ARTS NEARLY RELATED TO T BUILDING AND FITTING OF SHIPS.

(A.) THE ART OF MASTING. (See Sect. II. No. 10.)

De la Mature des Vaiſſeaux, par M. Le Camus. *A Paris, chez Jom jeune.* (2 liv. 5 ſous, French.)

Deſcription de l'Art de la Mature, par M. Romme, *Prof. &c.* 1 Fol. Maj. 82 Pages, and Copper-Plates.

Traite de la Mature des Vaiſſeaux a l'Uſage des Eleves de la Marine. M. Forfait. *Paris, chez Clouſier*, 1778. 4to.

(B.) ON THE RIGGING OF SHIPS.

The Art of Aparyling and Fitting of any Ships. (Referred to by Corn. Yk, in the book Sect. III. No. 6.)

Den volmaakte Bootſman. Amſterdam. 4to.

P. J. Hohenstierna *erfahrner Tackelmeiſter.* Ricl. 8vo.—

A Memoir of the Lieutenant-Colonel in the Swediſh Navy and Kn Mr. Nordenskiold, on the Engliſh manner of rigging their men of —In the *Orlogſmanna Selſkapets Handlingar. Forſta Haſlet.* 1778.

On the Dutch manner of rigging their ſkips of war. See the tw books, No. 26. Sect. II.

(C.) THE ART OF THE ROPE-MAKER.

Traite de la Fabrique des Manœuvres pour les Vaiſſeaux, ou l'Art Corderie Perfectionne. Seconde Edition, dans laquelle on a ajoute ce qui re les Cordages Goudronnees, par M. Du Hamel de Monceau, &c. *Paris, chez Deſaint*, 1769. 572 Pages 4to. Copper-plates.

(D.) THE ART OF THE SAIL-MAKER.

L'Art de la Voilure, par M. Romme, *Prof. Roy. &c. &c.* 1781. 64 folio, Copper-plates.

(E.) THE ART OF FORGING ANCHORS.

De la Fabrique des Ancres, par M. de Reaumur. (In the *Deſcr des Arts et Metiers. Tome* I.)—Is tranſlated into German by Mr. de J *Berlin, Stettin, and Leipzig, bey J. H. Rudiger*, 1762. 4to. 84 6 Copper-plates.

THE END.

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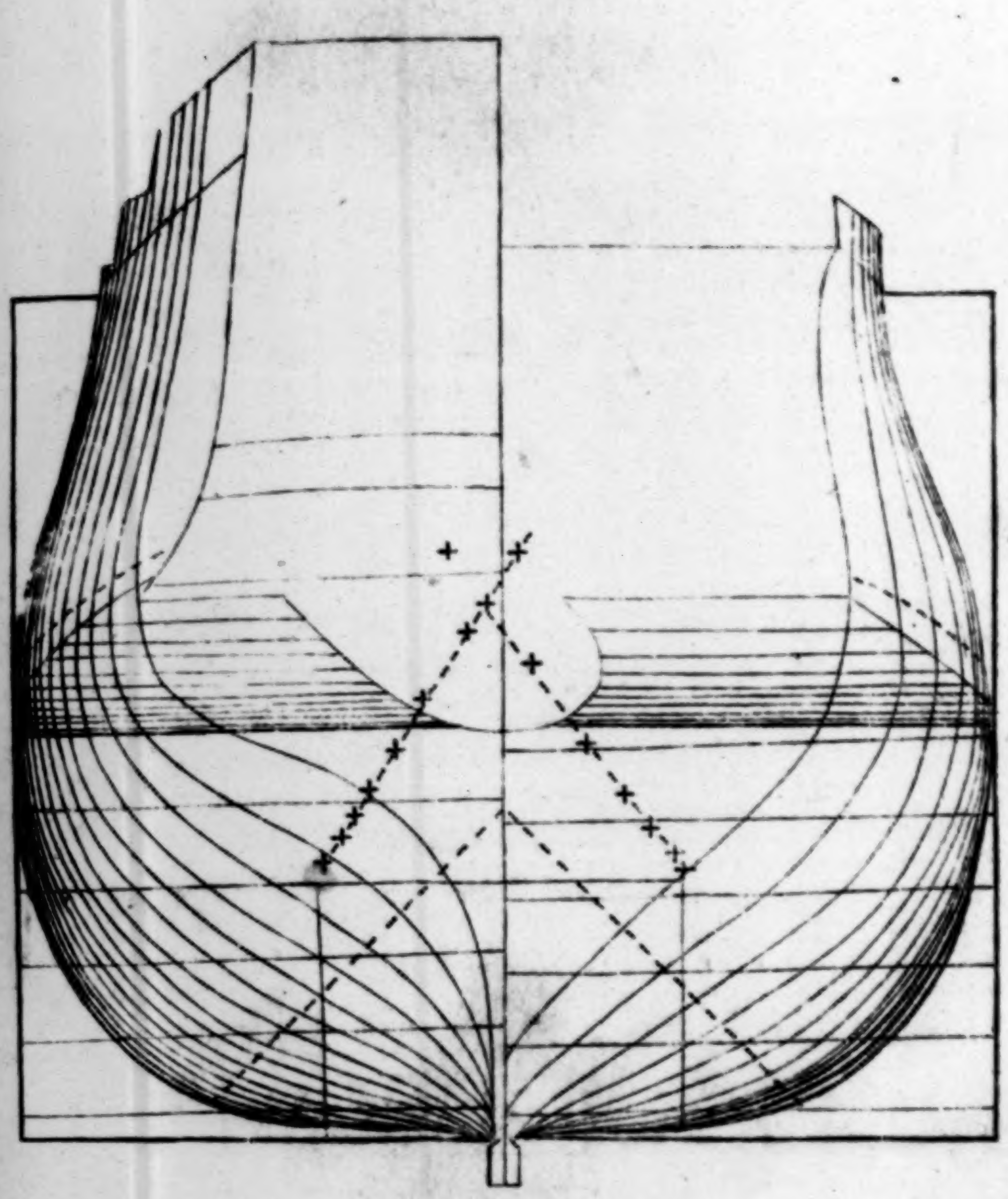

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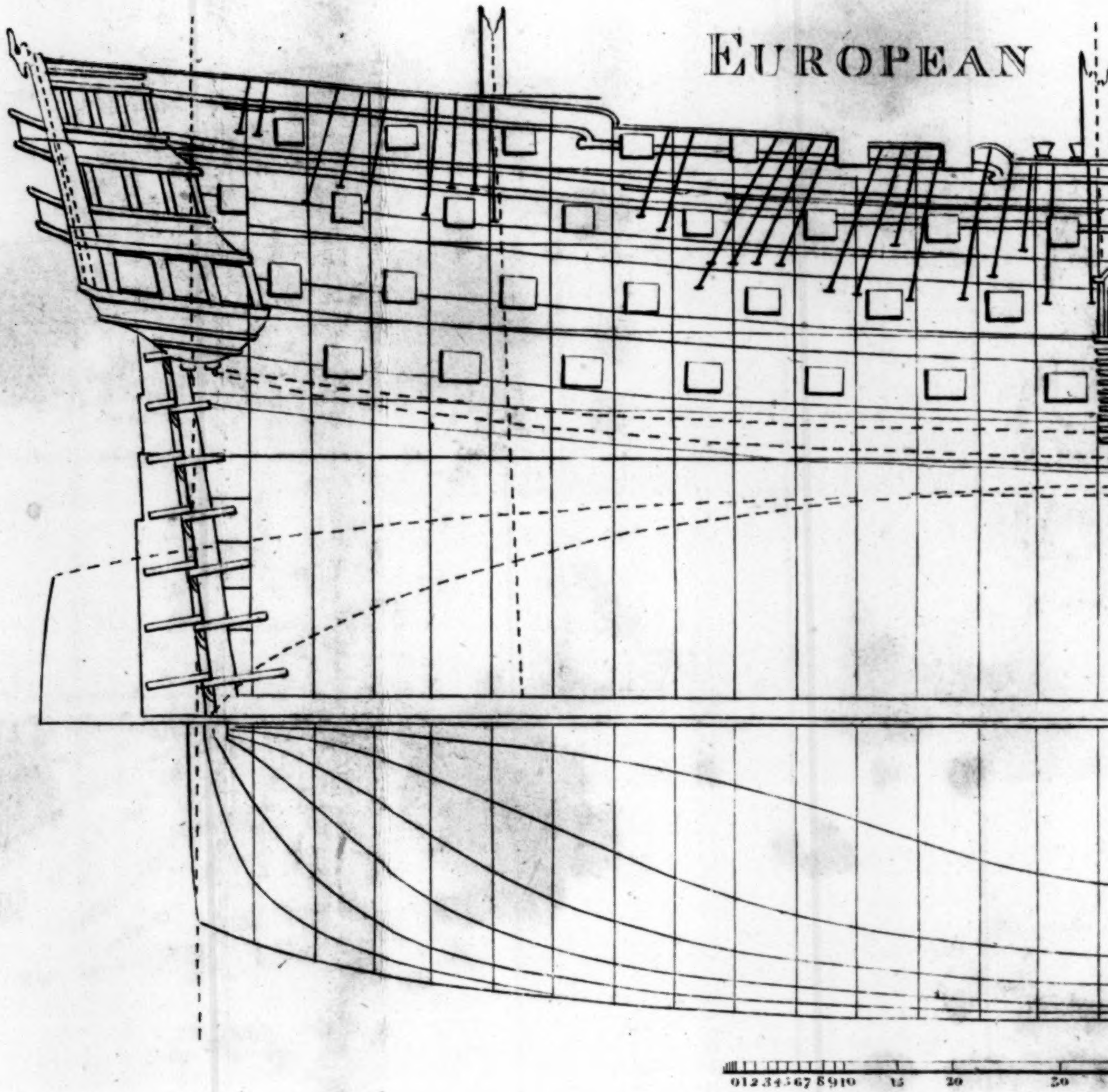

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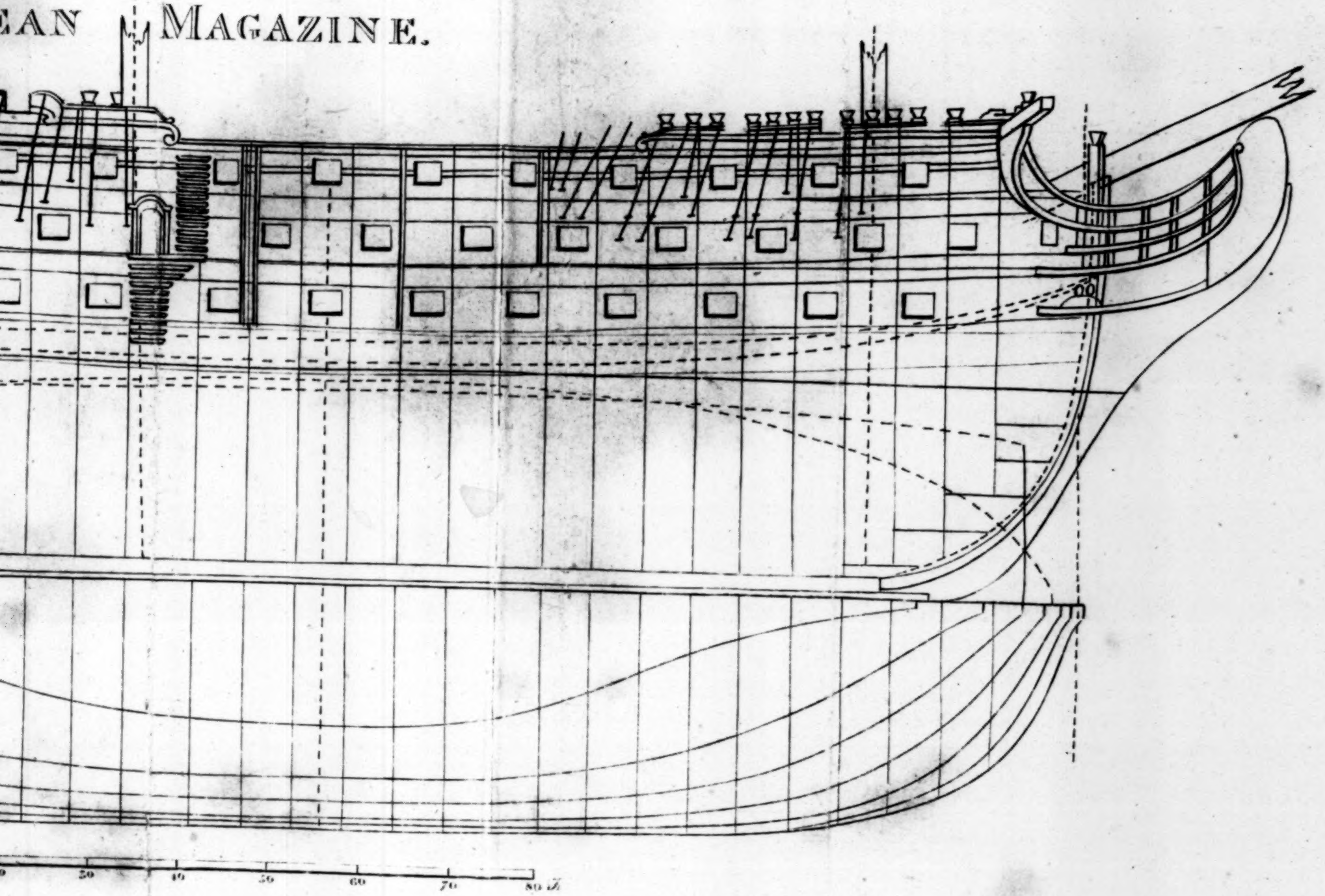

by J. Sewell 32. Cornhill Nov.r 1. 1790.

APPENDIX

TO THE

CATALOGUE OF BOOKS

ON

NAVAL ARCHITECTURE:

ntaining ſuch as are omitted by the AUTHOR of the ESSAY on the LITERATURE
of the Art of Ship-building.

hough this CATALOGUE RAISONEE is much enlarged ſince that pub-
liſhed in PART I. of this COLLECTION, yet being convinced that there ſtill remain many ſmall TRACTS, both PRINTED and in MANUSCRIPT, which have not come to our knowledge or obſervation, we take this opportunity of again ſoliciting both our Readers and the Public for the communication of the titles and characters of ſuch TRACTS, or of more voluminous WORKS, on the ſubject of NAVAL ARCHITECTURE, as they may perceive omitted in the preſent Catalogue.]

L*AZARI Bayfic Annotationes in L. II. de Captiuis et Poſtliminio reuerſis: in quibus Tractatur de Re Nauali. Ejuſdem Annotationes in Tractatum de Auro et Argento Leg. quibus Veſti-*
torum et Vaſculorum Genera explicantur. Omnia ab ipſo Authore recognita et aucta. Antonii
leſii de Coloribus Libellus, à Coloribus Veſtium non alienus. Leutetiæ, ex Officina Roberti Stephani,
ographi Regii 1549. *Ex Priuilegio Regis.*

his is a commentary on a law of Muſcellie's in the 49th book of the Pandects, and
dorned with many curious wooden cuts.

. *Navigation and Commerce, their Original and Progreſs: Containing a Succinct Account of*
ffic in general, its Benefits and Improvements: Of Diſcoveries, Wars, and Conflicts at Sea,
the Original of Navigation to this Day; with ſpecial Regard to the Engliſh Nation, their
ges and Expeditions, to the Beginning of our late Differences in Holland; in which his Ma-
's Title to the Dominion of the Sea is aſſerted againſt the novel and late Pretenders. By J.
yn, Eſq. F. R. S. London, 1674. 120 Pages.

. *The Diſcourſe made before the Royal Society 26th November* 1674, *concerning the Uſe of*
licate Proportion to ſundry Particulars. Together with a new Hypotheſis of Springing and
ic Motions. By Sir William Petty, Knt. F. R. S. London, 1674 12mo. 135 Pages.

his little book has two dedications, one to the Duke of Newcaſtle, and another to
Royal Society. It is divided into ſeventeen inſtances or heads: 1. Drawing or
ving Powers which force Ships through the Water. 2. Shapes or Sharpneſs of
ies. 3. Strength of Timbers. 4. Effect of Oars. 5. Motion of Travelling
ſes. 6. Strength and Velocity of Mills. 7. Effects of Gunpowder. 8. Diſtance
ound. 9. Diſtance of Smell. 10. Diſtance of Sight. 11. Time of Returns by
rating Pendulums. 12. Lives and Duration of Men. 13. Muſical Sounds.
Effects and Motion of Fire. 15. Riſing and Falling of Bodies. 16. Bellows.
Prices of Maſts, Diamonds, Timber, Amber, Loadſtones, &c. 18. Mill-dams
Sea-banks. 19. Compreſſion of Wool and other Elaſtic Bodies. With an Ap-
dix. The whole is treated with that preciſion and clearneſs which this great man
lly did other ſubjects. It is not in either the Engliſh or Iriſh edition of his works; we
efore propoſe to reprint it here, unleſs the noble Marquis would favour the world
a new edition of his works, many of which lie ſcattered about; and ſome very
able ones, we are informed, are yet in MS.

"I do not well remember the time when you were here and ſerved yourſelf by your own obſervations of the proceedings at Greſham College; but the lateſt entertainment has been from Sir William Petty, who (excuſe his ſlow proceedings by the trouble he and other Engliſh are in to defend the title of their lands) has done this: Upon two hollow and large cylinders he lays a kind of ſtage or float, and fits thereto ſails, ſhrowds, head and butt, all different from the common. With this veſſel he has made divers trials againſt the beſt veſſel at Dublin, and ſails two foot for their one, and makes more advantage of croſs winds than is done in the uſual way. His veſſel draws ſo little water, that harbours will be rendered uſeleſs; it can ſcarce be ſunk by ſtorm or enemies, and the coſt but half what ſhips of the like burthen ordinarily come to. This his firſt eſſay is on a veſſel twenty-five feet long; but he intends ſhortly to make one much larger, to be freighted for England." *A Collection of Letters in the laſt Century, by Abraham Hill, Eſq. in a Letter to John Brooke, Eſq.*

4. *England's Improvement by Sea and Land, &c. By Andrew Yarranton.* 1677.

5. *L'Arte di Reſtituere a Roma la tralaſciata Navigatione del ſuo Teuere, diviſa in tre Parti,* 1. *Ge' impedimenti che ſono nell' abues del Teuere da Roma a Perugia, e ſuoi Remedij.* 2. *Li difficolta, che ſono nella Navigatione del Teuere da Roma ſino al Mare, e ſuoi Remedij.* 3. *Nella quale ſi diſcorre perche Roma e Eſtata fabricata, e mantenuta ſu le ſponde del Teuere, e ſi Tratta d'alcun altre Propoſitioni proficue per lo Strato Eccleſiaſtico. Dell' ingegniero Cornellis Meyer Olandeſe, dell' Accademia Fiſicomatematica Romana. In Roma,* 1685. *Con Licenzade ſuperiore.*

6. *Dr. Wallis's Treatiſe on Algebra, Hiſtorical and Practical: ſhewing the Origin, Progreſs, and Practice thereof, and by what Steps it hath attained to its preſent Height; with the Addition of the Cono-Cuneus, or Shipwright's circular Wedge. Done at the Inſtigation of Lord Brounker and Mr. Pett, Commiſſioner of the Navy.* Fol. 1685.

We have the Sections of the CONO-CUNEUS cut in wood according to the directions of Dr. W. for the inſpection of the curious.

7. *Colloquia Maritima: or, Sea Dialogues; treating,* 1. *Of the Office of Commander in Chief.* 2. *Of the Duty of inferior Officers and Mariners on board his Majeſty's Ships of War.* 3. *Victualling of Ships.* 4. *Dictionary, or Explanation of Parts of a Ship; Sea-phraſes, or Words of uſed at Sea.* 5. *Of the beſt Ships of War, and Ceremonies of Entertainment, Salutes, Hailing, and Striking.* 6. *Ordering Fleets in Sailing-Chaſes, Boarding, and Sea-fights. By N. Boteler, Eſq. formerly a Commander in one of his Majeſty's Ships of War.* Printed at London, 1688.

This is a more curious than uſeful book at the preſent time, as moſt of it is much improved on in the publications of modern date. The following extract will ſerve to ſhew the opinion of the induſtrious author, and his zeal for the ſervice:

"ADMIRAL. But what ſay you touching the faſhion and form of their building and contriving?

"CAPTAIN. I ſay, that the three-decked ſhips, built fluſh fore and aft, without any falls or ſteps up or down (which both hinder the ready paſſage of men to and again, and peſter the ſhip beſides), and that have double forecaſtles, and their bulk and cubbidge heads full muſquet proof, and ſo in flank one with another, as that they may every way ſcour their decks with their ordnance laden with caſe-ſhot, and having loop-holes for the muſqueteers in covert, commanding every inch of them aboard, are thus far ſhips impregnable that they are not to be forced by any boarding, unleſs given up by treaſon or cowardice. But in theſe ſhips a prime care and regard is to be taken that they be roomy betwixt the decks where the ordnance lie, that ſo the guns may be more uſefully managed, and that thoſe that ply them may make the ſurer ſhots, and be leſs annoyed with the ſmoke of the powder: and a care is likewiſe to be had, that in the laying of the decks the lower tier of guns be not lodged too low and near the water (an error found committed in too many of his Majeſty's ſhips royal that are of the old building), but that the lower tier of guns may be carried out in all fighting weathers, without peril of taking in of water at any of their ports: and it is alſo to be obſerved, that theſe ſhips be not over-float built (a fault amongſt ſome others in ſome of thoſe late built pinnaces called the Whelps); for being ſo, unleſs the ſtaying of their maſts be very much aftward on, they can never ſail well by a wind; but proving leeward ſailers, they will be ſoon eaten out of it in a chace of any length: it is to be required alſo, that the bows and chaſes of theſe ſhips may be ſo contrived that out of them they may ſhoot as many guns right forward, and bowing as poſſibly may be; and that the ports be ſo cut out, as that the guns lie not right over one another, but ſo that upon the leaſt yaw of the helm one piece or other may ſtill be brought to bear; to which end alſo the ports are to be made ſo large that the guns may be every way traverſed."

8. *Ordonnance de Louis XIV. pour les Armées Navales et Arſenaux de Marine du* 15 *Avril* 1689. *Nouvelle Edition*, 8vo. Paris, 1732.

9. *Theorie de la Manœuvre des Vaiſſeaux. Paris*, 1689. *De l'expreſſe Commandement de ſa Majeſté.* With many Figures. No Name of Author.

10. *Memoirs relating to the State of the Royal Navy of England for Ten Years, determined* 1688, *by Sir Samuel Pepys, Secretary to the Admiralty*, 12*mo. With a Portrait.* London, 1690.

This tract ſhews the miſerable ſtate of the navy at that time. Both waſte and neglect had been ſo great, that there was not a ſhip that could put to ſea in leſs than four months when the Monmouth rebellion broke out; on which the king reſumed the management, recalled Mr. Pepys from impriſonment in the Tower, and appointed a new board of ſhipbuilders as Commiſſioners of the Admiralty.

11. *New Inventions of Milled Lead for ſheathing Ships againſt the Worm, better for ſailing, and cheaper above Cent. per Cent. than the old Way with Boards.* London, 1691.

This ſmall book contains the Navy Office's report of ſhips ſheathed with lead, many objections and anſwers; alſo, ſome MS. remarks relating to that affair; alſo, A Treatiſe on Naval Philoſophy, written by Sir William Petty, which being a ſcarce tract, and omitted in his works, we have reprinted in PART I. of this Collection.

12. *An Account of ſeveral new Inventions and Improvements now neceſſary for England, in a Diſcourſe by way of Letter to the Earl of Marlborough, relating to Building of our Engliſh Shipping, planting of Oaken Timber in the Foreſts, apportioning of public Taxes, the Conſervancy of all our Royal Rivers, in particular that of the Thames, the Surveys of the Thames, &c. Herewith is alſo publiſhed at large the Proceedings relating to the Milled Lead Sheathing, and the Excellency and Cheapneſs of Milled Lead in Preference to caſt Sheet Lead, for all other Purpoſes whatſoever. Alſo, A Treatiſe of Naval Philoſophy, written by Sir W. Petty. The Whole is ſubmitted to the Conſideration of our Engliſh Patriots in Parliament aſſembled.* London, 1691. Pages 125. 132. 12mo.

The firſt part is a diſpute about ſheathing, now entirely exploded; the latter part of Sir William Petty we have reprinted in PART I.

13. *The Seaman's Grammar and Dictionary, explaining all the difficult Terms in Navigation, and the Practical Navigator and Gunner.* 1. *Moſt plain and eaſy Directions how to build, rig, maſt, and yard any Ship whatever; with the Manner of working a Ship in all Weathers, and how to manage a Fight at Sea; alſo the Charge and Duty of every Officer in a Ship, and their Shares; alſo the Uſe of the petty Tally.* 2. *An Abſtract of the Art of Gunnery (or Shooting in great Ordnance and Mortar-pieces), wherein the Principles of the Art are plainly taught both by arithmetical Calculations and Tables ready calculated; with the Compoſitions of the ſeveral Fireworks uſeful in War both by Sea and Land. By Captain John Smith, ſome time Governor of Virginia, and Admiral of New-England. Now much enlarged by Variety of Experiments made by experienced Navigators and Gunners ſince his Time.* 4*to.* London, 1692. 163 Pages.

Very uſeful in the hiſtory of naval ſcience.

14. *Gloria Britannica: or, The Boaſt of the Britiſh Seas; containing a true and full Account of the Royal Navy of England, ſhewing where each Ship was built, by whom and when, its Tons, and Number of Men and Guns, both in Peace and War, at Home and Abroad. Together with every Man's Pay, from a Captain to a Cabin-boy.* London, 1698.

This is no other than a catalogue, and is amuſing to compare with the preſent liſt of the Royal Navy; except to obſerve, that many of them were built in private yards, as Blackwall, Graveſend, Harwich, Briſtol, &c. &c. An inference may be drawn, Whether Government cannot build on better terms in private yards, under proper ſurveyors? If time is allowed for them to ſtand on their frames to ſeaſon, it has been aſſerted they may; nearly as three for two.

15. *An Eſſay on the Navy; or, England's Advantage and Safety proved dependent on a formidable and well-diſciplined Navy, and the Encreaſe and Encouragement of Seamen. In Two Parts.* 1. *Demonſtrating the Neceſſity of a formidable Navy; what our Naval Force is in Number of Ships, their Names, Rates, Men, and Guns; the Method of Manning the Navy; the Seamen's Treatment, and Manner of Payment, and therein divers Hardſhips that they ſuffer; the Prejudice accruing to the Government (and Nation in general) thereby, as well as by the late Manner of Impreſſing; the Inconveniences thereof demonſtrated, &c.* 2. *Containing an humble Propoſal for removing the aforeſaid Grievances, and giving due Encouragement to the Seamen: effectually Manning the Navy at all*

Times in few Days, and thereby ſaving to the Government three or four Hundred Thouſand Pounds per Annum in Time of War, and be no Charge, but rather ſave Monies in Time of Peace. With a brief Touch on Greenwich Hoſpital for encreaſing the Revenues thereof. By the Author of the Seaman's Caſe. London, 1702. Small Quarto. 54 Pages.

16. *An Eſſay on the Mechaniſm of the Macrocoſm; or, The Dependence of Effects upon their Cauſes, in a new Hypotheſis accommodated to our modern experimental Philoſophy: in which are ſolved ſeveral Phænomena hitherto unaccounted for; as the Cauſe of Gravitation, Motion, Reflection, Refraction, &c. With a Method to find out the exact Rate that a Ship runs, and conſequently the Longitude at Sea. By Conyers Purſhall.* London, 1705.

17. *The General Laws of Nature and Motion; with their Application to Mechanicks. Alſo, the Doctrine of the Centripetal Forces and Velocities of Bodies, deſcribing any of the Conic Sections; being a Part of the great Mr. Newton's Principles. The Whole illuſtrated with Variety of uſeful Theorems and Problems, and accommodated to the Uſe of the younger Mathematicians. By Humphrey Ditton.* London, 1705. 232 Pages.

18. *Sectionum Conicarum Elementa Jacobo Milnes.* Oxon. 1712.

19. *Marine Architecture; or, Directions for carrying on a Ship from the firſt laying of her Keel to her actual going to Sea; with Tables of Proportions for Timbers, Maſts, Yards, Cordage, &c. By Edmund Buſhnel, Shipwright. 8th Edition.* 1716.

This contains many wooden cuts, tables, &c.; perhaps the beſt of its time, if not the only one.

20. *The Secret Hiſtory of his Majeſty's Ship-yard at Deptford; giving an Account of ſome material Tranſactions ſince its Beginning until the Year* 1716. *12mo.* 40 Pages. London, 1717.

This ſmall tract contains a ſhort account of the principal officers and builders, and their peculation; and is written with ſome acrimony, no ways intereſting to our undertaking, except to prove, that in thoſe days ſhips not "ſea-worthy" were fitted up at a great national expence.

21. *The Theory of the Handling or Working of Ships at Sea. Tranſlated from the Original, printed at Paris by the expreſs Command of his Majeſty, by Mr. Sutherland.* 83 Pages.

22. *The Navy Royal; or, A Sea-Cook turned Projector: containing a few Thoughts about Manning our Ships of War with the beſt Sailors without Violence, in the moſt pleaſing Manner, according to a Fourth Article of a late Propoſal publiſhed by our worthy Chaplain of his Majeſty's Ship the Lyme. By Barnaby Sluſh, Cook of the ſaid Ship.* 12*mo.* 122 Pages. *With a Preface.*

This book belonged to M. Dominicus, a builder. There is this MS. note at the beginning: "The writer, under a feigned name, gives a detail of all the various cheats and abuſes practiſed on board a man of war."

23. *Hiſtoire de Rochefort; contenant L'Etabliſſement de cette Ville, de ſon Port et Arſenal de Marine, et les Antiquitez de ſon Chateau. Paris, chez Biaſſon,* 1733. *Avec Privilege du Roy. 4to.* Pages.

This is a curious hiſtory of that important port to the French; and contains a good view of it with the buildings, from the arrangements of which it is believed the hints for the improvement and arrangement in our ſtorehouſes took birth.

24. *Dictionaire de Marine; contenant le Termes de la Navigation et de l'Architecture Navale. Enrichi de Figures repréſentant divers Vaiſſeaux, le principal Piece ſervant la Conſtruction, &c. Seconde Edition. Reviſée et augmentée. 4to.* Amſterdam, 1736.

25. *Il conſolato del Mare Colta Spiegazione di Giuſeppe Maria Caſaregia Auditore della Rota Fiorentina, e conſigliere di Giuſtizia et S. A. R. In Queſta prima Veneta Impreſſione oltre tutto cio che s'attrova nell' Edizioni di Firenze, e di Lucca aggientovi molte Leggi della Sereniſſima Republica di Venezia attinenti alla materia. Con il Portolano del Mare D'Alviſe da Moſto Nobile Veneto. Venezia* 1737. *Per Franceſco Piacentini. Con Licenza de' ſuperiori, e Privilegio.*

26. *The Timber-Tree improved; or, The beſt Practical Methods of Improving Lands with proper Timber, and thoſe Fruit-Trees whoſe Woods make the moſt profitable Returns to their Owners. By William Ellis, of Little Gaddeſden, Herts.* 8vo. 110 Pages. London, 1738.

Many of this author's tracts are valuable; his obſervations are in general good, and we are informed, this has much merit.

27. *The Motion of Fluids Natural and Artificial, in particular that of Air and Water, in a familiar Manner propoſed, and proved by evident and concluſive Experiments and Remarks, done with ſuch Plainneſs and Perſpicuity as that they may be underſtood by the unlearned, for whoſe Sake is added a ſhort Explanation of uncommon Terms, which in treating this Subject could not be avoided without Affectation. Second Edition. By M. Clare, A. M. and F. R. S. With Nine Plates, containing many Figures in each Plate.* 8vo. London, 1738. 369 Pages.

28. *Johannis Bernouilli, M. D. Matheſeos Profeſſ. Regiarum Societarum Pariſienſis, Londinenſis, Petropolitanæ, Berolinenſis, Socii, &c. Opera Omnia.* 4 *vols.* 4*to. Lauſannæ et Genevæ*, 1742.

In the ſecond volume of this work is his "Eſſai d'une Nouvelle Theorie de la Manœuvre des Vaiſſeaux."

29. *Sherwin's Mathematical Tables, contrived after a moſt comprehenſive Method: containing Dr. Wallis's Account of Logarithms; Dr. Halley's and Mr. Sharp's Ways of conſtructing them; with Dr. Newton's Contraction of Briggs's Logarithms, viz. A Table of Logarithms of the Numbers from* 1 *to* 101,000, *with the Means to find readily the Logarithm of any Number, and the Number of any Logarithm, to ſeven Places of Figures: and Tables of Natural and Logarithmic Sines, Tangents, Secants, and Verſed Sines, to every Minute of the Quadrant; with the Explication and Uſe prefixed. Third Edition. Carefully reviſed and corrected, by William Gardiner.* London, 1742.

This book is ſufficiently known to all calculators: this edition is eſteemed the moſt correct.

30. *A Propoſal to determine our Longitude. By Jane Squire. Second Edition.* London, 1743. 8vo. 160 Pages.

Beſide this edition, we are in poſſeſſion of a royal quarto edition in French and Engliſh, elegantly printed.

31. *Harleian Miſcellany, Vol. I. containing a Collection of ſcarce, curious, and entertaining Pamphlets and Tracts, as well in MS. as Print, found in the Earl of Oxford's Library.* London, 1744. 4to.

In this large collection we find but few papers on the Navy. This volume contains one on the Danger of a threatened Invaſion, by a Kentiſh Gentleman, 1701: Orders ſent to the Duke of Medina to be obſerved in his Voyage to England: A Diſcourſe on the Spaniſh Invaſions: An Enquiry into the Cauſes of our Naval Miſcarriages: with a few more tracts that ſeem to belong more to politics and government of a marine than conſtruction, conſequently not ſtrictly within our plan.

32. *Ordonnance de la Marine du Mois d'Aouſt* 1681, *commentée et conferée ſur les anciennes Ordonnances, le droit Romain, et les nouveaux Réglemens. Nouvelle Edition.* 8*vo.* Paris, 1747.

33. *The Practical Sea-Gunner's Companion; or, An Introduction to the Art of Gunnery: containing Decimal Arithmetic, Practical Geometry, Trigonometry, with its Application to the Meaſuring of Heights and Diſtances, the Duty of a Gunner, &c.; the true Allowance of Powder for Proof; Service, Salutes, and Scaling of all Ordnance now in Uſe; the Nature, Length, and Weight of Iron Ordnance; of the ſpecific Gravity of Lead, Braſs, Iron, &c. with its Uſe in finding the Weight of different Kinds of Metals. Alſo, the true Diameters of the Bores and Ball, whereby the Wind Allowance is exactly known; the Weight and Diameters of Iron Spheres; Magnitude and Weight of the ſeveral Shells (now in Uſe), when empty or filled; Length of the Fuzes, and Time of Burning, &c.; of Carcaſes ancient and modern; a Catalogue of Gunners and Armourers Stores, with the Quantity of Arms allowed for a Ship of each Claſs, new Eſtabliſhment; and ſeveral other Particulars, as will appear by the Table of Contents. Being the Subſtance of the Captains Povey and Binning, with large Additions and Improvements. By William Mountaine, Teacher of the Mathematics. Printed for W. and J. Mount and T. Page, in Poſtern-Row, on Tower-Hill,* 1747.

34. *Penderazioni ſopra la Contrattazione Marittima Ricavate dalla Legge Civile, e Canonica, dal Conſolato di Mare, e dagli Uſi Marittimi, con le formole di tali Contratti, profittevoli non ſolo a' Praticanti nel Foro, ma ancora ad ogni ſorta di Mercanti, e Marinari, dal Dottiſſimo Carlo Targa Giureconſul lo Genoveſe, In queſta nuova Edizione diligentemente rivedute, ed a molti errori corrette. In Genova,* 1750, *Nella Stamperia del Caſamara dalle Cinq. Lampudi, con Licenza de ſuperiori. Aſpeſe di Dominico Semini q. Giamo Filippo.*

35. *Nouveau Cours de Mathematique a l'Uſage de l'Artillerie et du Genie. Ou l'on applique les Parties les plus utiles de cette Science a la Theorie et a la Practique des differens Sujets qui peuvent avoir rapport a la guerre. Nouvelle Edition, corrigee et conſiderablement augmentee. Par M. Belidor, Colonel d'Infanterie, Chevalier de l'Ordre Royal et Militaire de St. Louis, Membre des Academies Royales des Sciences de France, d'Angleterre, et de Pruſſe. Paris, chez Nym,* 1757. *Avec Approbation et Privilege du Roi.*

36. *An Hiſtorical Account of a new Method for extracting the foul Air out of Ships, &c.; with the Deſcription and Draught of the Machines by which it is performed. In Two Letters to a Friend. By Samuel Sutton, the Inventor. The Third Edition. To which are annexed, Two Relations given thereof to the Royal Society, by Dr. Mead and Mr. Watſon; and a Diſcourſe on the Survey, by Dr. Mead.* London, 1757. 120 Pages.

This was among the firſt attempts to preſerve the health of ſeamen on board ſhips; a ſubject which has been attended with ſuch good conſequences, that long voyages have been made with little and ſometimes no loſs.

37. *Conjunct Expeditions; or, Expeditions that have been carried on jointly by the Fleet and Army. With a Commentary on a Littoral War, By Thomas More Molyneux, Eſq.* London, 1759.

This is rather a hiſtory of the various expeditions by ſea and land united than any ways within our plan, though there are a few paſſages appertaining thereto.

38. *Naval Evolutions; or, A Syſtem of Sea Diſcipline: Extracted from the celebrated Treatiſe of P. L. Hoſte, Profeſſor of the Mathematics in the Royal Seminary of Toulon, confirmed by Experience. Illuſtrated by Examples from the moſt remarkable Sea Engagements between England and Holland, with Copper-plates, adapted to the Uſe of the Britiſh Navy. To which are added, An Abſtract of the Theory of Ship-building; an Eſſay on Naval Diſcipline, by a late experienced Sea Commander; a General Idea of the Armament of the French Navy, with ſome practical Obſervations. By Chriſtopher O'Bryen, Eſq. Lieutenant of his Majeſty's Navy.* 4to. 1762.

39. *Heart of Oak the Britiſh Bulwark: Shewing,* 1. *The Reaſons for paying greater Attention to the Propagation of Oak Timber than has hitherto been manifeſted.* 2. *The Inſufficiency of the preſent Laws to prevent the Want or Scarcity of that Commodity.* 3. *The Teſtimony of the moſt eminent Timber-Merchants, Shipwrights, &c. proving not only the great Decreaſe, but the proportionate Decreaſe, for Thirty or Forty Years back, of the full-grown Timber fit for the Navy or Merchant-Service, in the principal Timber Counties through the Kingdom.* 4. *That the Neglect of Planting, if not immediately remedied, will be the Ruin of the Kingdom.* 5. *The Author's Opinion what would be the moſt effectual Method to prevent this Calamity. Humbly offered to his Majeſty and the Parliament, as well as to all Proprietors of Land in Great-Britain. By Roger Fiſher, Shipwright, of Liverpool.* London, 1763 4to. 97 Pages. and a Third Edition, 123 Pages. London, 1771.

"Mr. Fiſher humbly offers theſe particulars to the conſideration of his Majeſty and Parliament, as well as all Proprietors of Lands in Britain; and certainly the ſubject is of the utmoſt weight and importance. The general inattention of late years to a circumſtance ſo intereſting to the whole nation is really aſtoniſhing; but it is to be hoped, the laudable regard paid to this, among a multitude of other uſeful articles, by the worthy Society for Encouragement of Arts, will greatly contribute to excite ſuch a ſpirit among our landed gentlemen, as may not a little conduce towards remedying the evil ſo pathetically ſet forth by the author of this valuable tract; a tract for which he deſerves the thanks of every one who wiſhes well to the ſecurity and proſperity of theſe kingdoms." MONTHLY REVIEW, vol. XXIX. p. 473.

40. *The Britiſh Mars; containing ſeveral Schemes and Inventions to be practiſed by Land and Sea againſt the Enemies of Great-Britain, ſhewing more plainly the great Advantage Britain has over other Nations by being Maſters at Sea. In Two Parts. I. The Conſtruction of Boats both to ſtow in leſs Room of Ships, and go ſwiftly to diſcover an Enemy's Coaſt, and to land and embark Troops with greater Safety; alſo to conſtruct Veſſels to lie nearer the Shore, to better Protect the Troops in landing or embarking; alſo Rolling Defences to be uſed as floating Batteries, or as Floats for landing Cannon, &c. and for making Defences and Batteries on Shore more expeditiouſly, and*

for filling-up Ditches, &c. Alſo contains a Method to fit old Ships of War, and ſmall floating Batteries, to batter Land Defences with greater Force; and another Method to fit old Ships of War (that cannot be ſunk by Shot) to lie before Batteries and receive the Shot while other Ships paſs by: with Remarks and Obſervations. Part II. contains Methods to fortify Dwelling-Houſes, that even Women and Children may defend themſelves from Indians with Small-Arms: Deſigned for our Settlements in America and other Places: Alſo a new Method of Fortification and making Batteries. To which is added an Appendix, containing a Scheme for manning the Britiſh Navy with leſs Grievance to the Subject, and a Scheme to employ Seamen; of a Copper-mine near Hudſon's-Bay; and of Diſcovering the North-weſt Paſſage, or determining there is no ſuch Paſſage; with Cautions and Directions. By Joſeph Robſon, Engineer. The Whole illuſtrated by Eleven Plates. London, Printed for the Author; and ſold by William Flexney, near Gray's-Inn Gate, Holborn, 1763.

41. *Tactique Navale; ou Traite des Evolutions et des Signaux; avec Figures en Taille-douce. Par M. le Viſcomte de Morogues, Capitaine de Vaiſſeaux du Roi, Chef de Brigade du Corps Royal de l'Artillerie, Membre de l'Academie de Marine, &c. 4to.* Paris, 1763.

42. *Cours de Mathematique, a l'Uſage des Gardes du Pavilion et de la Marine. Par M. Bezout, de l'Academie Royale des Sciences, et de celle de Marin, 6 Vols. 8vo. Firſt publiſhed between* 1764 *and* 1769.

This elementary work is conſtantly referred to by Clairbois, and almoſt all the modern French writers on conſtruction: it contains Vol. I. Arithmetic; Vol. II. Geometry; Vol. III. Algebra; Vol. IV. & V. Mechanics; Vol. VI. Navigation; and is eſſentially neceſſary in reading thoſe authors.

43. *An Earneſt Addreſs to the People of England; containing an Enquiry into the Cauſe of the great Scarcity of Timber; with ſome Hints towards the more effectually ſecuring and preſerving the ſame, particularly that Part of it applied to Ship-building.* London, 1766. 8vo. 77 Pages.

This ſmall pamphlet is written in dialogue. The calculations ſeem to be very accurate as to the ſtate of the navy, and the quantity of timber requiſite to build the different rates. But its chief deſign is to prove the waſte of timber conſumed by the artificers being allowed a bundle of chips twice a day, which they carry away as perquiſite for fuel. The author's calculation is, that three quarters of an hour's labour is loſt in deſtroying uſeful pieces, which he calculates for fifty years paſt has coſt the Government between two and three millions of money. He ſays, allowing the men threepence a-day, with which they would be content, would not amount to above one quarter of that ſum.

The publiſher, ſtill living, but retired from buſineſs, ſays, it was written by a Mr. Yeomans Lott; that 1000 were printed and ſoon ſold, inſomuch that he could not get a copy, of which he has been in ſearch for many years back; that Lord Sandwich ſent for the author, and gave, or rather created for him, the place of maſter-meaſurer to the ſawyers; that he was removed to Plymouth, and enjoyed this place to his death.

We have reprinted it in our SECOND PART, where its truth or falſhood will be confirmed or refuted by the rule of common ſenſe or plain truth.

44. *Important Hints towards an Amendment of the Royal Dock-yards, &c. &c. By a Man of Kent. 8vo. 1s.* Wilkie.

"In our Review for May 1766, p. 396, we mentioned "An Earneſt Addreſs to the People of England," relating to the enormous waſte and havock made of the ſhip-timber in the royal dock-yards, under colour of perquiſites to the artificers, &c. The preſent tract contains ſome farther repreſentations on that very important ſubject, and on the great waſte of time employed in gathering together and carrying off the chips, as the term is; with a propoſal for making a ſaving of many thouſand pounds *per ann.* to the nation, by a proper increaſe of the workmen's wages in lieu of this deſtructive perquiſite." MONTHLY REVIEW.

45. *Dizionarie Iſtorica, Teorico, e Pratico di Marina. Di Monſieur Saverien. Tradotto dal Franceſe. Venezia,* 1769.

46. *Architecture Hydraulique, ou l'Art de conduire, d'elever, et de manager les Eaux pour les differens Beſoins de la Vie. Par M. Belidor. 4. Vols. 4to.* Paris, 1737. 1739. 1750. 1770.

This curious book, full of plates, is well known to engineers of every nation, particularly ſuch as are employed in the conſtruction of harbours, of which there is a very ample account of the French.

47. *The Conſtruction of Timber from its early Growth ; explained by the Microſcope, and proved from Experiments, in a great Variety of Kinds. In Five Books. On the Parts of Trees, their Veſſels, and their Encreaſe by Growth : and on the different Diſpoſitions of thoſe Parts in various Kinds ; and the Particularities in their Veſſels, with Figures of their various Appearances ; of the Inſtrument for cutting them ; and the Microſcope through which they were viewed. By John Hill, M. D. Member of the Imperial Academy.* London, 1770. 170 Pages.

48. *A Report from the Committee appointed the 11th Day of March 1771, to conſider how his Majeſty may be ſupplied with Timber. Publiſhed by Order of the Houſe of Commons 1771. Folio.* 89 Pages. *With a Plate, deſcribing the Knees and Timbers of a Seventy-four Gun Ship.*

In this book is contained the opinions of the moſt eminent Builders on this material point at that time, which are not much different from the preſent ſtate ; but this will appear more fully when the enquiry now on foot (the ſtate of timber) makes its appearance next Seſſions of Parliament.

49. *Hiſtory of the Female Shipwright, to whom Government has granted a Penſion of Twenty Pounds per Annum during Life. Written by Herſelf. 12mo.* London, 1773. 191 Pages.

A rare inſtance of female labour and conſtancy.

50. *Abſtract on the Mechaniſm of the Motion of Floating Bodies. By M. De La Croix, Commiſſary-general of the Marine, &c. &c. Tranſlated from the French, and publiſhed by Admiral Knowles, and now re-printed. 1s. 6d.*

" This little Treatiſe contains more knowledge in the art of ſhip-building than any book hitherto publiſhed, that I have met with. The principles the author proceeds upon are juſt and true ; I have verified them by a number of experiments, and they agree exactly with the calculations he gives ; but what proved moſt ſatisfactory to me, was their anſwering perfectly well when put into practice, in ſeveral line-of-battle ſhips and frigates that I built whilſt I was in Ruſſia. CHARLES KNOWLES."

51. *Nouveau Commentaire ſur l'Ordonnance de la Marine du Mois d'Aout* 1681. *Par M. Renne Joſue Valin, Avocat et Procureur du Roi au Siege de l'Amiraute de la Rochelle. Nouv. Edit. rev. corrigée et augmentée. 2. Tom. 4to.* Rochelle, 1776.

52. *Traité ſur la Conſtruction des Vaiſſeaux. Dedié et preſenté au Roi par Monſ. le Comte du Mail de Goimpy, Capitaine des Vaiſſeaux de ſa Majeſté, &c, &c. 4to.* Paris, 1776.

53. *A general View of the Dimenſions of the moſt approved Ships of each Claſs in the Britiſh Navy, with the exact Dimenſions of their Maſts, Yards, Rigging, Blocks, Guns, Gun Carriages, Anchors, and Cables, according to the Eſtabliſhment of* 1778. *On a ſingle Sheet of Paper, in Form of a Table or Map.* 3s.

54. *An Eſſay on the Duty and Qualifications of a Sea-Officer. Written originally, anno* 1760, *for the Uſe of Two young Officers, by the Rev. James Ramſey, Chaplain in his Majeſty's Navy.* London, 1780.

55. *Regulations and Inſtructions relating to his Majeſty's Sea-ſervice, eſtabliſhed by his Majeſty in Council. 11th Edition. 4to.* 1782.

This book is uſually given with the commiſſions to the commanders, and contains the rules for the government of the royal navy when equipped.

56 *A Seaman's Remarks on the Britiſh Ships of the Line, from the 1ſt of January* 1756 *to the 1ſt of January* 1782. *With ſome occaſional Obſervations on the Fleet of the Houſe of Bourbon. 8vo. 6d.* Dodſley.

" According to this ſenſible letter, which is aſcribed to the ſon of a late diſtinguiſhed Admiral, aſſiſted by his noble father's papers, our preſent naval inferiority to the Houſe of Bourbon has ariſen from a fatal error in practice of late years, proceeding from an opinion, that ſhips ſpeedily built, or, as they are termed, green ſhips, are unfit for ſervice ; and that, to render them durable, the frames muſt remain a conſiderable time on the ſtocks to ſeaſon. Thus we are told, that the Polypheme of 64 guns, the St. George and Glory of 98, and the Royal Sovereign of 100, ſet on in 1774, ſtill continue on the ſtocks ; and that the ſame blind ill-fated ſyſtem is ſtill purſued, which chills every manly effort, and blaſts every exertion in the cauſe of our country. In the mean while, How have our enemies acted ? It is well known, they completed a threedecker of 110 guns in fourteen months at Breſt; two ſixty-fours in ſeven months at Toulon; and a ſeventy-four, in the fleet which engaged Admiral Kempenfelt, was built, launched, rigged, and ſtored, in ninety-five days at Breſt. Theſe facts, for ſuch they may now be deemed, having been before ſtated in Parliament, are beyond expreſſion melancholy, when we conſider the time thus loſt under an infatuation! If we ſuffer ourſelves to be vanquiſhed by green ſhips until our frames are ſeaſoned, what are we to do then? Shall we now be ſeaſoning ſhips for the uſe of our enemies? But the writer ſhews, from chronological tables of our ſhips of war for many years back, that this notion of ſeaſoning ſhips is a ſpeculative miſtake. Were it allowable to deſpair of the commonwealth, it might be juſtly inferred, that *quem Deus vult prius dementat*." M. Rev. vol. LXVI. p. 304. This we may conclude is a local Tract: it might be neceſſary to uſe ſuch expedition at that time, and has been done in private yards; a ſeventy-four has been built in fourteen months, but experience will not allow it a good practice.

57. *A Treatiſe on the Rectilineal Motion and Rotation of Bodies; with a Deſcription of original Experiments relative to the Subject. By G. Atwood, M. A. F. R. S. late Fellow of Trinity College, Cambridge.* 1784. 8*vo.*

A work of peculiar excellence and utility in the elementary part of this ſubject.

58. *An Addreſs to the Right Hon. the Lords Commiſſioners of the Admiralty, upon the degenerated, diſſatisfied State of the Britiſh Navy; with Ways and Means to put the Navy upon a formidable and reſpectable Footing, both as to Ships and Men. Alſo a Propoſition to eſtabliſh a new Mode of Caulking the King's Ships; with a propoſed Regulation for maintaining an extra Eſtabliſhment of Marines in Time of Peace; and a Recommendation to eſtabliſh a General Naval Regiſter Office. To which is added, A Propoſition for eſtabliſhing Commiſſaries on board the King's Ships; and various other Strictures upon the Naval Service in general. By a Sailor. Second Edition.* London, 1784. 98 Pages.

This author ſeems very free with the Navy Board: his greateſt complaint is againſt the material with which ſhips are caulked. He ſays, old rotten decayed junk, that ſoon moulders to powder, ſeems to have a ſubſtitute that he would recommend; which not being accepted (perhaps for good reaſons), he makes this violent attack on that Board in general.

59. *Mathematical Tables: containing Common, Hyperbolic and Logiſtic Logarithms; alſo Sines, Tangents, and Verſed Sines, both Natural and Logarithmic: together with ſeveral other Tables uſeful in Mathematical Calculations. To which is prefixed, a large and original Hiſtory of the Diſcoveries and Writings relating to thoſe Subjects, with the complete Deſcription and Uſe of the Tables. By Charles Hutton, LL. D. F. R. S. Profeſſor of the Mathematics in the Royal Academy of Woolwich. A very large* 8*vo. Volume, neatly printed.* London, 1785.

This book comes not under our claſs of Conſtruction; but the uſe of logarithms being ſo great in all calculations, and particularly in Curve Calculations, we mention it only to notify ſuch aid, it being in many reſpects ſuperior to preceding books of logarithms.

60. *Advice to Officers of the Britiſh Navy.* 12*mo.* London, 1785. 116 Pages.

This piece of irony, in which the writer has taken Swift's Directions to Servants for his model, may probably contain ſome truths of importance.

61. *Silva; or, A Diſcourſe on Foreſt Trees, and the Propagation of Timber, as delivered before the Royal Society in* 1661. *By Sir John Evelyn. A new Edition, with many Improvements, by Dr. Hunter, of York; and elegant Prints.* 4*to.* 1786.

This book is juſtly eſteemed, and may be eſteemed an Engliſh claſſic; had we a diviſion ſo called, it would ſtand one of the foremoſt.

62. *Codice per la Veneta Mercantile Marina approvato dal Decreto dell' Eccellentiſſimo Senato* 21 *Septembre*, 1786. *Per li Figliuoli del Qu. Z. Antonio Pinelli, Stampatori Ducali.*

63. *Deſcrizione Iſtorica dell' Eſtrazione della Publica Nave la Fenice dal Canal Spignon, in cui giaque circa tre anni totalmente ſommerſa, Impreſſa Dall Excellentiſſimo Senato Appoggiata alla nota eſperienza del nobil Uomo Giovanni Zuſto Preſtantiſſimo Senatore, e verificata ſotto la di lui Direzione e Commando. Scritta in Ordine al decreto* 23*d Nov.* 1786.

L'Anno 1789, *per Figliuoli del Q. Antonio Pinelli Stampatori Ducali.* 4*to.* 31 Pages. *Diſcours Preliminaire.* 89 Pages, 7 folding Plates.

This book contains a very curious account of the mechanical proceſs uſed in raiſing a Venetian man of war of 74 guns which was loſt in a hurricane off the harbour of Malamocco,

lamocco, and had lain there about three years, to the great detriment of the harbour. The method uſed to raiſe her will eaſily be underſtood from the excellent and elegant plates which accompany the work.

64. *Tranſactions of the American Philoſophical Society held at Philadelphia, for promoting uſeful Knowledge.* 2 *Vols.* Philadelphia. R. Aitkin, 1786. 4to.

Theſe contain Dr. Franklin's remarks and opinions on ſhips being deſerted too early on ſpringing a leak, the moſt material of which we reprinted in PART I. of our COLLECTION; but there are many other curious articles on other ſubjects.

65. *An Addreſs to the Right Hon. the Firſt Lord Commiſſioner of the Admiralty upon the pernicious Mode of coppering the Bottom of King's Ships in the Time of Peace: alſo, a Plan for employing* 120 *Sail of the Line, with a proportionable Number of Frigates and ſmall armed Veſſels, with the Number of Men that will be required to man each Claſs in Time of War; together with a Recommendation for eſtabliſhing a general Regiſter of Seamen, and a Mode to eſtabliſh a Naval Militia, &c. By an Officer.* 8*vo.* 1*s.* 6*d.* Stockdale, 1786.

"Reſpecting naval arrangements, the author recommends the building of 74 gun ſhips inſtead of thoſe carrying only 64; and brings ſeveral calculations to prove, that by employing thirty-ſix ſhips of 74 guns, inſtead of forty of 64, we ſhall give a ſuperior weight of metal, and procure a conſiderable ſaving to Government.

"Our author diſapproves of coppering ſhips as ſoon as they are built; and ſays, that after four or five years they will require re-caulking, and become univerſally leaky, ſerving as coffins to bury our ſeamen in the ocean. He would have all the men of war lay in ordinary with wooden bottoms, carefully protected againſt the worm, and when ordered for ſea, to be firſt caulked and then coppered.

"For the manning a fleet of 120 ſail of the line, he propoſes the following expedients: A general regiſter of ſeamen; to reduce ten regiments of cavalry, and apply their pay to maintain 8000 marines; and that a naval militia ſhould be kept up in the different pariſhes of England and Wales. Theſe he computes at 9,500; and propoſes, upon an average, each pariſh ſhould ſupport two men, and that Scotland and Ireland ſhould bear their proportion. He eſtimates the annual expence of that eſtabliſhment at about five pounds a man. Theſe are the chief traits of this piece; a performance which, in point of general merit, does not riſe much above mediocrity."

MONTHLY REVIEW, Vol. LXXIV. p. 473.

66. *Obſervations on the preſent State of the Art of Navigation; with a ſhort Account of the Nature and Regulations of a Society now forming for its effectual Improvement. By James Ferguſſon.* London, 1787. 8vo. 27 Pages.

67. *The Seaman's new Vade Mecum: containing a practical Eſſay on Naval Book-keeping; with the Method of keeping the Captain's Books, and complete Inſtructions in the Duty of a Captain's Clerk, &c. By R. Liddell, Purſer in the Royal Navy.* 8*vo.* 5*s.* Boards. Robinſons, 1787.

"This performance contains every neceſſary inſtruction for keeping the accounts of the ſhip: the methods now in uſe are clearly explained, and ſpecimens of the different books are added, as examples of the rules that are given. Forms of orders, certificates, receipts, &c. are ſubjoined, The methods of keeping the ſignal-book are largely treated, and illuſtrated with numerous coloured engravings. A brief Maritime Dictionary is added; which is extremely uſeful, eſpecially for noviciates or landmen; and the book concludes with an abſtract of the Act of Parliament commonly called The Articles of War.

"From this account of the contents of the preſent performance, our readers will eaſily perceive the purpoſes for which it has been written; and, as far as we are able to judge, it ſeems well calculated to anſwer the author's intention."

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68. *The Art of War at Sea; or. Naval Tactics reduced to new Principles, with a new Order of Battle. Illuſtrated with Copper-plates. Tranſlated from the French of Viſcount de Grenier, Rear-Admiral of the French Navy, by the Chevalier de Sauſeuil.* 4*to.* 1788.

This publication does not ſtrictly rank in our intended plan, as it tends chiefly to order of battle, manœuvring, &c. &c. We truſt there are profeſſional men in our ſervice capable of judging if any ſuperior merit is in it.

69. *The Manœuvrer; or, Skilful Seaman: being an Eſſay on the Theory and Practice of the various Movements of a Ship at Sea, as well as of Naval Evolutions in general. Tranſlated from the French of M. Bourdé de Villehuet, by the Chevalier de Sauſeuil, Knight of the Moſt Noble Order of St. Philip, &c. &c. &c. Illuſtrated with Thirteen Copper-plates, Five of which, with many intereſting Obſervations interſperſed through the Work by Way of Notes, are the Production of an Engliſh Officer.* 4*to*. 18*s*. Boards. Hooper. 1788.

There are few ſubjects on which a good treatiſe is more wanted in England than that of naval tactics; for notwithſtanding we had many books on the ſubject before this tranſlation of M. Bourdé's work appeared, yet none of them were fully ſcientific, and, at the ſame time, ſufficiently elementary for the purpoſe of inſtructing youth who are intended for naval employments. The preſent work is not exactly that which we wiſh to ſee; but it appears to us greatly ſuperior to any thing we have met with before on this head; and as its reputation is thoroughly eſtabliſhed among the author's countrymen, we apprehend it will meet with a favourable reception here, and be ſtudied by our naval cadets, at leaſt till ſomething better adapted to our own ſervice makes its appearance, which probably may not ſoon happen.

The work is divided into four Parts. In the firſt, M. Bourdé treats of the action of fluids on the ſurfaces of ſolid bodies; the effects of theſe actions when the bodies which they act on are at liberty to obey the impulſe made on them; and of the centers of gravity and gyration of bodies: and having laid down the firſt principles of the motion of fluids, and of bodies after percuſſion, in a plain and elementary manner, he proceeds to apply thoſe principles in calculating the action of the wind on the ſails of a ſhip, and of the water on her rudder; and thence to determine the true and apparent velocities of the ſhip, with the direction of her motion. He demonſtrates that the velocity of the ſhip will be as the ſine of the angle of incidence of the wind on the ſail, as long as the poſition of the ſail, with reſpect to the keel of the ſhip, remains the ſame: and he ſhews, that in order to remove from a coaſt, or from any given line, at the greateſt rate poſſible, the tangent of the apparent angle of incidence of the wind on the ſail muſt be double the tangent of the angle which the ſail makes with the keel of the ſhip, at the ſame time that the angle formed by the keel and the coaſt is equal to the real angle of incidence. He next conſiders the effect of thoſe ſails which are before, and thoſe which are abaft, the center of gravity of the ſhip ſeparately, as well in regard to their force in urging the ſhip a-head, as in cauſing her to ſteer well; and after ſhewing from theory the great uſe of the ſpritſail, jib, and fore-ſtayſails, in cauſing a ſhip to ſteer well, when ſailing by the wind, he juſtly remarks, that we find by experience the ſails yet more uſeful in this reſpect than the theory makes them to be. The rudder becomes afterwards the object of our author's conſideration: he ſhews by reaſonings both obvious and natural, that it acts to the greateſt advantage when it makes an angle of 45 degrees with the direction of the keel, and not when it makes an angle of about 55 degrees, as hath been ſo long inſiſted on in books of geometry; but, except in putting a ſhip about, M. Bourdé juſtly obſerves, that the leſs neceſſity there is for the action of the rudder the better. Under this article alſo he very properly takes notice, that as ſhips are generally conſtructed, the rudder cannot act under a greater angle with the keel than about 30 degrees: and he propoſes to augment the range of the rudder by ſhortening the length of the tiller; and to compenſate for the power which will be thus loſt, by encreaſing the diameter of the wheel we ſteer by, or by diminiſhing the diameter of the barrel on which the tiller rope is wound. We are as well convinced as M. Bourdé can be of the benefit which would ariſe from encreaſing the range of the rudder, and that it may be done by ſhortening the tiller: we are alſo perſuaded, that the power which will be loſt by ſhortening the tiller may, in ſome meaſure, be replaced by reducing the barrel of the wheel, or by encreaſing the diameter of the wheel itſelf; but we are at the ſame time of opinion, that the encreaſe of power which can be gained by either or both of theſe means is very limited: for the barrel cannot be diminiſhed much, without conſiderably encreaſing the number of turns which the rope will make on it; and which, beſides the loſs of time it will occaſion in ſhifting the rudder, will often cauſe one turn to ride on another: and the diameter of the wheel cannot be greatly encreaſed, eſpecially in line-of-battle ſhips, becauſe it is always placed under the poop, and therefore limited to the height of it.

The ſecond Part of this work contains the application of the theory to practice, and exhibits reaſons for all the evolutions that are to be performed with a ſhip. The problems which are here reſolved relate to the manner of getting under ſail when the ſhip is riding with her head to the wind; and when there is no current, to do the ſame by means of a ſpring; to tack or wear a ſhip; to lie-to, or to diſpoſe the ſails ſo that they may exactly counteract each other; and to lie-to, in a gale of wind, under any ſail whatever. As this laſt manœuvre is ſeldom practiſed but when the winds are violent and contrary, there is ſcarcely any operation of this kind which is not liable to failure: M. Bourdé has therefore endeavoured to remedy theſe defects, by diſcuſſing each ſeparately, and pointing out the methods which are leaſt ſubject to ſuch inconveniencies.

His next concern is to direct the ſeaman how to chaſe a ſhip, ſo as to come up with her in the ſhorteſt poſſible time. Several mathematicians have treated of the curve of purſuit, or that track which one body muſt purſue, under certain circumſtances, to come up with another; but few or none of their ſuggeſtions are applicable to ſhips at ſea. M. Bourdé ſhews, that in chaſing to windward, the chaſing ſhip ought to tack as often as ſhe brings the chaſe on her beam. This has indeed been ſhewn before by L'Hoſte and others; and it is ſaid, that old Admiral Barnet was the firſt who practiſed it. In chaſing to leeward, he directs us to keep the chaſe always on the ſame point of the compaſs that ſhe was on when firſt ſeen. Directions are added, in both theſe caſes, for the ſhip which is chaſed.

His next object is boarding; under which head he gives ample inſtructions for boarding to windward and leeward, when you come up with the chaſe on a wind, when going large, and when the ſhip to be boarded is at anchor: but, notwithſtanding this uſeful work has now been twenty-four years in the hands of its author's countrymen, we do not recollect to have heard of many exploits of this kind being performed by them in the courſe of the laſt war! His inſtructions for avoiding this terrible mode of attack are equally good, and ſhew him to be a moſt excellent ſeaman. This part is concluded with rules for coming to an anchor under various circumſtances.

In the third Part, M. Bourdé treats largely on the maſting of veſſels, and contends earneſtly, that ſhips of war are generally much over-maſted in the French ſervice. We have heard very good judges of the matter ſay the ſame of our own; but we believe the practice is ſtill purſued in both ſervices. As this, however, is a point of great importance, he ſhall ſpeak for himſelf.

After combating the preſent cuſtom of tantmaſting with great force of argument, he refers us to the treatiſe of M. Bouguer on this ſubject, for the beſt rules that can be given for the maſting of ſhips. He next treats of the different modes of ſtepping the maſts, and ſhews the advantages and diſadvantages which attend each: of the cut of the ſails, and the mode of ſetting them ſo that the impulſe from the wind may be the greateſt poſſible: of the advantages and diſadvantages of having a greater or leſs quantity of ſail abroad under different degrees of wind: of the fitting-out of ſhips: of careening and ſheathing them: of the ſcantling of the timbers, and the tumbling home of the top-timbers: of ballaſting, lading, and rigging them; and many other particulars, equally important, but which are too numerous to mention here: and in every one of them M. Bourdé exhibits, in our opinion, great profeſſional ſkill and ingenuity.

The fourth and laſt Part of this work conſiſts of an eſſay on naval evolutions; in which he deſcribes and directs the diviſion of fleets; the orders of convoys, of ſailing, of battle, and retreat: the methods of drawing up in order of battle, and of changing it, when occaſion, either by a ſhift of the wind or the ſituation of an enemy: the methods of manœuvring a fleet under all its various orders; ſuch as avoiding an action, or forcing an enemy to come to one; in doubling on an enemy, or forcing his line, &c. &c.: and he concludes his work with a plan of ſignals both for day and night.

The notes and remarks which are added from the papers of an Engliſh officer do him credit: they relate principally to thoſe articles in which the practice of the Engliſh navy differs from that of the French, and will be found by the Engliſh reader to be a valuable addition to M. Bourdé's work.

70. *A Report on the practical Utility of Kenneth M'Culloch's improved Sea-Compaſſes, founded on Eighteen Months Experience of thoſe Inſtruments on board one of his Majeſty's Cruizing Frigates in the Channel of England.* Small 8vo. 14 Pages. 1789.

Whatever invention tends to improve the practice of navigation ought to be favourably received by every Britiſh reader. In this point of view Mr. M'Culloch ſeems to deſerve the approbation of his countrymen; and he will, we hope, derive ſome benefit to himſelf from his uſeful invention.

This report was given in to the Board of Admiralty by Capt. Phil. D'Auvergne, commanding the Narciſſus frigate, December 29, 1788; and it contains the reſult of various experiments and obſervations made on board that frigate, in the Engliſh Channel, ſince the month of April 1787; in which Mr. M'Culloch's compaſs was compared with other approved compaſſes. The reſult may be judged of from the following extract:

"Sailing through the Race of Alderney, in a ſtorm of N. E. wind, in December 1787, againſt a flood-tide, the ſhip ſailing at the rate of eleven miles on the ſurface, and ſcarcely making any head-way by the land, the ſea, as will readily be concluded by naval judgments, was of an awful height, and ſo extremely irregular, that the motion is undeſcribable. None of the compaſſes of Mr. Adams, on Dr. Knight's conſtruction, would ſtand (in the ſea phraſe), but vacillated more than four points on each ſide of the Pole: at this time Mr. M'Culloch's ſteering compaſs quickly and readily recovered the vacillations communicated to it by the motion of the ſhip, and the ſhocks of the ſea, pointing with little variation to the Pole in a manner to command the admiration of all that were within reach to obſerve it, and to win the confidence of the moſt timorous.

"I acknowledge myſelf that I would have put the higheſt truſt in it, had a fog or thick weather come on in the critical ſituation we were in; while the compaſſes ſupplied from his Majeſty's ſtores were only fit to convey alarm, and inſpire anxiety and doubts."

By other experiments, Captain D'Auvergne found that theſe compaſſes (both the ſteering and azimuth) were equally ſuperior; and therefore warmly adviſes his brother officers to make trial of them. At his recommendation theſe compaſſes were tried on board the Andromeda, commanded by Prince William Henry, who was ſo much ſatisfied of the utility of the invention, that he honoured Mr. M'Culloch ſo far with his countenance, as to appoint him his compaſs-maker.

We do not doubt that, under ſuch patronage, this invention will meet with ſuch trials as will fairly appreciate its real merits in a ſhort time. If it ſhould prove, in every caſe, as ſuperior to others as Captain D'A. experienced, it will indeed be a very valuable diſcovery.

71. *An Eſſay to direct and extend the Enquiries of Patriotic Travellers; with further Obſervations on the Means of preſerving the Life, Health, and Property of the unexperienced, in their Journies by Land and Sea. Alſo, A Series of Queſtions intereſting to Society and Humanity, neceſſary to be propoſed for Solution to Men of all Ranks and Employments, and of all Nations and Governments; compriſing the moſt ſerious Points relative to the Objects of all Travels. To which is annexed, A Liſt of Engliſh and Foreign Works, intended for the Inſtruction and Benefit of Travellers; and a Catalogue of the moſt intereſting European Travels, which have been publiſhed in different Languages, from the earlieſt Times, down to September* 8, 1787. *By Count Leopold Berchtold, Knight of the Military Order of St. Stephen, of Tuſcany, &c. &c.*

This book ſhews the inquiſitive mind of the author: he has ſhewn how others may travel to advantage, and pointed out many pertinent obſervations to ſuch as would benefit by it; among which thoſe of naval matters are not forgot.

72. *A Treatiſe of Univerſal Inland Navigations, and the Uſe of all Sorts of Mines. A Work entirely new. Recommended to the Inhabitants of Great-Britain and Ireland; plainly demonſtrating the Poſſibility of making any River and Stream of running Water in the World navigable, by Canals of a new Conſtruction, without Locks and Dams, with Eſtimations of the Expence of the making thereof per Mile in Length. Together with the Conſtruction, Explanation, and Uſe of a new-invented Mechanical and Hydraulical Machine, for inland Navigation, of this new Conſtruction, which will raiſe, on an inclined Plane, Boats or Lighters and Cargoes all at once, even to Fifty Fathoms in Perpendicular, without unloading. To which is added a Supplement, plainly demonſtrating the Poſſibility and Means whereby a Ship of any Size may be launched at any Time, except at Low Water, without waiting the Time of High Water. Together with the Conſtruction, Explanation, and Uſe of a Machine for that Purpoſe; with Tables to ſhew the Power and Force required to draw or roll a Ship up upon a Launch of any Size not more than Two Thouſand Tons. By Edmund Leach, Surveyor.* 8*vo.* London. 5s.

73. *The Ship-Maſter's Aſſiſtant: containing complete Information as well to Merchants, Maſters of Ships, and Perſons employed in the Merchants Service, as to Officers and others of the Royal Navy, relative to the Mercantile and Maritime Laws and Cuſtoms. Third Edition, improved and enlarged.* 8*vo.* 1790.

Though this book does not properly claſs with our deſign, yet there are ſeveral pieces of knowledge not to be obtained in any other manner, except by references to Acts of Parliament, Admiralty orders, and other informations difficult of acceſs. It has alſo the ſection of a firſt-rate, with explanation of all its parts, by reference, very uſeful to the young ſailor; who for want of inſtructions in a ſeminary of this uſeful though common knowledge, waſtes much time and labour to obtain it.

74. *An Eſſay on Naval Tactics, ſyſtematical and hiſtorical, with explanatory Plates. In Four Parts. By John Clark, Eſq. of Eldin, Fellow of the Society of Antiquaries, and of the Royal Society of Edinburgh.* 4to. Boards. 10s. 6d.

The firſt part of this work contains thirty plates, on attack of ſingle ſhips and great fleets, with remarks on the engagements of the late two wars; and theorems.

75. *Deſcriptions and Sketches of ſome remarkable Oaks in Welbeck Park, in Nottinghamſhire, a Seat of the Duke of Portland. With 10 Plates neatly executed by Mr. Ellis, and 23 Pages of Letter Preſs, containing ſome judicious Remarks on the Durability of that Wood.* 4to. 1790.

76. *Obſervations on the Diſeaſes, Defects, and Injuries in all Kinds of Fruit and Foreſt Trees; with an Account of a particular Method of Cure invented and practiſed by William Forſyth, Gardener to his Majeſty, at Kenſington.* 8vo. London, 1791. 71 Pages.

On all hands this method of cure is allowed to be good.

77. *Traité Pratique du Gréement des Vaiſſeaux et autres Batimens de Mer. Ouvrage publié par Ordre du Roi, pour l'Inſtruction des Eléves de la Marine, ſous le Miniſtére de M. de Fleurieu. Par M. Leſcallier, Commiſſaire Géneral des Colonies, cidevant Ordonnateur dans la Guiane Hollandoiſe, et enſuite dans la Guiane Francois, Correſpondant de la Societes Royale d' Agriculture de Paris; avec Planches et Figures. Paris, chez Clouſier, Firman Didot.* London, P. Elmſley. Amſterdam, *chez* G. Dufcur, 1791. Vol. I. 488 Pages. Vol. II. 83 Pages. 34 Plates, neatly executed.

This work is collected with as great induſtry as the author's former work. In his Preface he gratefully acknowledges the information he had from our Engliſh artiſts.

78. *A View of the Naval Force of Great-Britain: in which its preſent State, Growth, and Converſion of Timber; Conſtruction of Ships, Docks, and Harbours; Regulations of Officers and Men in each Department, are conſidered and compared with other European Powers. To which are added, Obſervations and Hints for the Improvement of the Naval Service. By an Officer of Rank.* Price 5s.

"When profeſſional men of rank and fortune, poſſeſſed of an independent ſpirit, will ſtep forth and communicate the fruits of their knowledge and experience to the Public, we feel ourſelves under a particular obligation to them. The author of this Treatiſe, on a ſubject moſt intereſting to Engliſhmen, as a great maritime and commercial nation, ſeems to have no object in view but the public good.

"It is clear, by the ſtyle and manner of this work, that the author is not a writer by profeſſion. We have therefore forborn all minute criticiſm. But his intentions are certainly laudable, and his work abounds with uſeful hints and obſervations, which will, we hope, be attended to.

"A New Society which we obſerve is inſtituted for the improvement of Naval Architecture will be moſt likely to forward this Gentleman's views for the public benefit in a department ſo eſſential to the intereſts and very being of this country."

ANALYTICAL REVIEW, July 1791.

79. *The Sail-Maker's ready Calculator: a Table of the Quantity of Canvas and other Materials uſed in making a Suit of Sails, for Eight Months Service, for a Ship of each Rate in the Royal Navy, with the Number of each Sail allowed to the Suit, and the total Value. Alſo, the Number of Yards contained in each Sail of a 74 Gun Ship, and a Ship of 400 Tons in the Merchants Service. Likewiſe a ſingle Suit of Sails for Eaſt and Weſt-India Ships, with the full Value, ſpecifying the Quality of Canvas the different Sails are made of in the Royal Navy and Merchants Service; with the Price per Yard given by Government, and the Weight of each Bolt of good Canvas.* London, 1791.

80. *Obſervations on the Propagation and Management of Oak Trees in general, but more immediately applying to his Majeſty's New Foreſt in Hampſhire, with a View of making that extenſive Tract of Land more productive of Timber for the Uſe of the Navy. In a Letter addreſſed to the Right Hon. John Earl of Chatham, Firſt Lord Commiſſioner of the Admiralty. By T. Nichols, Purveyor of the Navy for Portſmouth Dock-yard.* 8vo. 42 Pages. Southampton: Printed and ſold by J. Bew, in Paternoſter-row. Price 1s. 6d.

This ſmall Tract appears to be written with the honeſt zeal of a perſon who has the intereſt of the nation and navy much at heart. There are ſeveral curious obſervations on the growth of timber and management of woodlands no where elſe to be found. The fencing, draining, and thinning of woods are treated in a plain and convincing manner; alſo a peculiar circumſtance pointed out, which we never found in any other treatiſe, of a capital miſtake when our Parliament paſſed two Acts, about the year 1700, for encloſing and planting 1000 acres in addition to the New Foreſt in Hampſhire, for the expreſs purpoſe of growing timber for Portſmouth yard, much of which is come to its maturity, and proves, on cutting down, to be what the woodmen call the Durmaſt Oak, a term we never before heard of: perhaps it may be provincial, and may be ſynonymous to what in Suſſex is called the Fir Oak; the timber of both which is ſo inferior to the real Engliſh oak, as to be rejected not only for ſhip but all other building. On application to this gentleman, he politely gave us liberty to copy any part or the whole of his Tract, with ſprigs of the different oaks, which we propoſe to get deſcribed by ſome of our friends ſkilled in botany; ſo that every gentleman in the kingdom may be furniſhed with the means of diſtinguiſhing the valuable from the inferior ſpecies.

81. *A new Edition, with the Author's laſt Additions and Corrections, of Mr. Ludlam's Deſcription and Uſe of Hadley's Quadrant.*

82. *An Introduction and Notes on M. Bird's Method of dividing Aſtronomical Inſtruments. To which is added, A Vocabulary of Engliſh and French Technical Terms, by William Ludlam, late Fellow of St. John's, Cambridge.*

83. *An Account of a ſimple, eaſy, and effectual Method for preſerving his Majeſty's Navy from its preſent great Decays.* 1774. 4to. 9 Pages, *beſides the Dedication to the late Lord Le Deſpenſer, which is ſigned John Simmons.*

After lamenting the decay of the navy, and the vaſt conſumption of timber occaſioned thereby; after ſhewing the cauſes of this decay, and the ineffectual expedients that have been uſed to prevent it, the author propoſes his own method, which is, that ſhips being built of the beſt timber, well ſeaſoned, when they are finiſhed all but caulking and painting, they ſhould be ſo covered as to be defended from the rain and ſnow, and be kept on the ſtocks. He obviates the objections to this ſcheme; and concludes, that it would ſave one hundred thouſand pounds *per* annum to the public, and that the ſhips when called for would be in better condition, and fit for longer ſervice.

84. *Arcano del Mare, di D. Ruberto Dudleo, Duca di Nortumbria e Conte di Warwick, diviſo in Libri ſei. Nel primo de quali ſi tratta della Longitudine praticabile in diverſi modi, d' invenzione dell' Autore. Nel ſecondo, delle Carte ſue generali, e de' Portolaris rettificati in Longitudine, e Latitudine. Nel terno, della Diſciplina ſua Marittima e Militare. Nel quarto, dell' Architettura ſua Nautica di Vaſcelli da Guerra. Nel quinto, della Navigazione ſcientifica, e perfetta, cioé Spirale, o di gran Circoli. Nel ſeſto, delle Carte ſue Geografiche, e Particolari. Impreſſione Seconda, corretta et accreſeinta, ſecondo l'originale del medeſimo Eccellentiſſimo Signor Duca, che ſi conſerva nella Libreria del Convento di Firenza della Pace, de' Monaci di S. Bernardo dell' Ordine Fulienſe. Con l' Indice Generale di tutta l'Opra, e de' Capitoli, e delle Figure, et Iſtruzione a' Librai per legarle. Alla Sereniſſima, e Glorioſiſſima Republica di' Venetia. In Fiorenza* MDCLXI. *Nella Nuova Stamperia, per Giuſeppe Cocchini, all' Inſegna della Stella. An iſtanza di Jacopo Bagnoni, et Antonfranceſco Lucini. Con Licenza de' Superiori.*

The firſt edition was printed in 1646, alſo at Florence; but *nella Stamperia di Franceſco Onofri*: It was inſcribed, *Al Sereniſſimo Ferdinando Secondo, Gran Duca di Toſcana, ſuo Signore.* Both are in three volumes folio, and extremely rare, having, probably, not been ſold, but only given away as preſents. In the firſt edition the volumes are of different ſizes. The firſt, of a common folio ſize, containing two *tomes*, or the firſt Four Books. The ſecond, of a large folio ſize, containing the Fifth Book, or the Firſt Part of the third volume. The third, of an Atlas ſize, and containing the Second Part of the third *tome*, or the Sixth Book.

The copy in the Britiſh Muſeum of the ſecond edition is in three volumes, all of the ſame Atlas ſize; the firſt containing the letter-preſs of the Six Books, and the other two volumes the plates.

The dedication to this edition is ſigned by Lucini, who executed the engravings. He informs us, that the Duke of Northumberland had ſpent forty years in preparing for this work, and that he himſelf had retired into a little village of Tuſcany twelve years for the ſame purpoſe. Next follows a General Table of Contents; then the Preliminary Diſcourſe of the Author, and the Firſt Book, containing 30 pages: 27 copper-plates belong to it.

Book II. 24 pages, and 23 plates.
Book III. 26 pages, and 6 plates.
Book IV. 12 pages, and 14 plates.
Book V. 26 pages, and 89 plates.
Book VI. 41 pages, and 130 ſea charts.

Other copies are diſtributed ſomewhat differently.

The Fourth Book is wholly upon Naval Architecture, and is illuſtrated by 14 plates; in which are given figures of veſſels of ſeven different kinds, which he calls, 1. Galeone. 2. Ranbargo. 3. Galiſabre. 4. Fregata o Pinnaſe. 5. Galione. 6. Galerata. 7. Paſſavolante.

Sir Robert Dudley was not only admired by Princes; but alſo by the learned; among whom he had a very high rank, as well on account of his ſkill in philoſophy, chemiſtry, and phyſic, as his perfect acquaintance with all the branches of the mathematics, and the means of applying them for the ſervice and benefit of mankind. He wrote ſeveral things. We have mentioned the account of his voyage. His principal work is, "*Del arcano del Mare,*" *&c. Firenze,* 1630. 1646. This work has been always ſo ſcarce, as ſeldom to have found a place even in the catalogues that have been publiſhed of rare books. It is full of ſchemes, charts, plans, and other marks of its author's mathematical learning; but is chiefly valuable for the projects contained therein for the improvement of navigation and the extending of commerce.

His genius prompting him to great exploits, and having a particular turn to navigation and diſcoveries, he projected a voyage into the South Seas, in hopes of acquiring the ſame ſame thereby as his friend the famous Thomas Cavendiſh, of Trimley, Eſq. whoſe ſiſter he had married; but after much pains taken, and money ſpent, the Government thought it not ſafe for him to proceed. Afterwards, however, he performed a voyage, ſetting out in November 1594, and returning in May 1595; an account of which, written by himſelf, is publiſhed in Hackluyt's Collection of Voyages. In the year 1603, he commenced a ſuit, with a view of proving the legitimacy of his birth; but no ſooner had Lettice, Counteſs of Leiceſter, notice of this, than ſhe procured an information to be filed againſt him and ſome others for a conſpiracy, which was ſuch a blow to all his hopes, that, obtaining a licence to travel for three years, which was eaſily granted him, he quitted the kingdom.

The place which Sir Robert Dudley choſe for his retreat abroad was Florence, where he was very kindly received by Coſmo II. Great Duke of Tuſcany; and in proceſs of time was made Great Chamberlain to his Serene Highneſs's conſort, the Archducheſs Magdalen of Auſtria, ſiſter to the Emperor Ferdinand II. with whom he was a great favourite. He diſcovered in that Court thoſe great abilities for which he had been ſo much admired in England. He contrived ſeveral methods of improving ſhipping; introduced new manufactures; excited the merchants to extend their foreign commerce; and by other ſervices of ſtill greater importance, obtained ſo high a reputation, that, at the deſire of his miſtreſs the Archducheſs, the Emperor, by letters patent dated at Vienna, March the 9th, 1620, created him a Duke of the Holy Roman Empire. Upon this he aſſumed his grandfather's title of Northumberland; and ten years after got himſelf enrolled by Pope Urban VIII. among the Roman nobility. Under the reign of the Grand Duke Ferdinand II. he became ſtill more famous, on account of that great project which he formed of draining a vaſt tract of moraſs between Piſa and the ſea; for by this he raiſed Livorna, or Leghorn, from a mean and pitiful place into a large and beautiful town: and having engaged his Serene Highneſs to declare it a free port, he, by his influence, drew many Engliſh merchants to ſettle and ſet up houſes there. In conſideration of his ſervices, and for the ſupport of his dignity, the Grand Duke beſtowed upon him a handſome penſion, which however went but a little way in his expences; for he affected magnificence in all things, built a noble palace for himſelf and his family at Florence, and much adorned the Caſtle of Carbello, three miles from that capital, which the Grand Duke gave him for a country retreat, and where he died in September 1639.

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